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THE GALAXY  
PREMIER ISSUE

# Galaxy

VOLUME 40 NUMBER 1

\$1.50

## IN THE DAYS OF THE STEAM WARS

An Exciting New  
Illustrated Series

MICHAEL  
KALUTA:  
FANTASY  
ARTIST

## ELECTRONIC LIFESTYLE

Science by Steve  
North

## IN THE SHUBBI ARMS

By Steven Utley &  
Howard Waldrop

AMERICAN  
BOOK AWARD  
WINNER

JEM — PART 5  
by Frederik Pohl



## Editorial

# Oh, No! They've Changed It!



**W**HAT WOULD YOU say if I told you that terrorists broke into editorial offices of *Galaxy* and demanded that we enlarge the magazine, radically alter the page design, and add more graphics and visual materials? Won't buy it, huh? I was afraid of that.

Okay, I admit it. The new management of *Galaxy* has been tinkering with the design and content of a thirty-year-old publication. I didn't want to admit it at first because the overwhelming reaction of regular readers to any change in their magazine is bound to be negative. I guess this is the place for me to explain what is going on here.

To those of you who were very attached to the digest size, and especially to those of you facing the prospect of building new

bookshelves just to hold your copies of *Galaxy*, I offer my apologies. But I want to point out that it's time to bid the digest-sized science-fiction magazine good-bye. It is no longer necessary. Science fiction is respectable now and you don't have to hide your magazine inside a library book to read it. A larger magazine has a better chance of attracting the notice of the casual reader when it goes out for sale. If we can get more casual readers in here, we might entice some to stay for a while and become serious readers, thus contributing to the health of science fiction in general and *Galaxy* in particular.

As a matter of fact, you will notice as you page through the new *Galaxy* that most of the changes are there for attracting new readers. This doesn't

mean that we are going to change it from a special interest publication to a mass consumer item. We think we have found design and editorial concepts which will open *Galaxy* up to a wider readership and still preserve the special interest elements which we all know and love.

Remember the *Galaxy* cover design from a generation ago? They used to call it the "inverted L." We are using a cover design which is very similar to the old inverted L, which we have always regarded as a classy design. We have also brought back the typeface used in the original *Galaxy* logo from thirty years ago. In this issue you will also find an advertisement written by *Galaxy*'s famous first editor, H.L. Gold. Thirty years later, it reads not so much like an advertisement as an editorial comment. You can trust us to follow that commitment.

Not all of our changes look to *Galaxy*'s golden past, however. Let me enumerate the things we are doing which are brand new (not just for *Galaxy*, but in some cases for science fiction publishing as a whole).

**Change Number One: The Modules.** Readers generally fall into one of two groups: dippers and diggers. Dippers page through a magazine and pick out things that interest them, reading here and there as they feel like it. Diggers get hold of an article and read it right through to the very end, sometimes demanding footnotes and suggestions for additional reading. Every magazine editor faces the basic problem of catering to both the dippers and the diggers, the classic problem of supplying both substance and variety. We have a brand new approach to this problem: reading modules. Each issue of *Galaxy* has two feature articles (one on science and one about science fiction) and six to ten modules. The modules are short items and each one is

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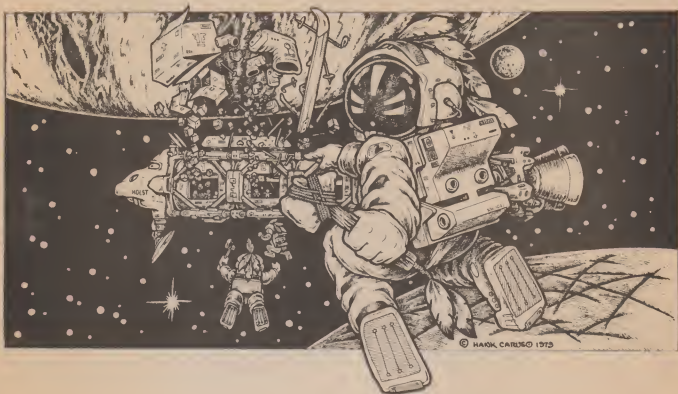


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# FAMOUS EVENTS OF THE FUTURE

## THE JOVIAN SKI PARTY



*On December 16th, 2017, two dozen members of the group "Children of Liberty" (a political action organization of European radicals) seized the Jupiter Company's flagship HOLST and, without proper authorization, jettisoned four tons of alpine and nordic skiing equipment into Jovian space. The "Party" was a protest against the massive tax burden placed on so-called "luxuries" bound for Eurpoa, Ganymede and other Jovian moons. The colonials, infuriated by what they considered unfair taxation (with no corresponding representation on either the board of the Jupiter Company or Earth's U.N. Security Council), boarded the HOLST disguised as aboriginal natives of pre-technological North America, although they didn't really fool anybody for a second.*

Science-fiction, right? Wrong. It could be future history, especially if the United Nation's Agreement on the Moon and other Celestial Bodies is signed in its present murky form. As it stands, the Agreement mandates the establishment of a new multi-national Regime with jurisdiction over the entire solar system. It effectively bans private enterprise from outer space, and requires *all* activities in space to be under the control of an OPEC-like Earth monopoly. If the human race is to avoid the mistakes of the past, human and political freedoms *must* be assured off-planet. The time to start is now, and the way to begin is to learn the facts. Why are we interested in this? We're the L-5 Society, and we're *going*. Join us. Write:

The L-5 Society  
1620 North Park  
Tucson, Arizona 85719.

written specifically to complement one of the longer feature articles. If you are a digger, you can get hold of the feature and follow it right through as usual, but the modules will pop up along the way and they will seem to you to be a lot like footnotes. If you are a dipper, on the other hand, you can skim the feature for the material of interest to you and at the same time, you will get a lot of little interesting items along the way. Each of the smaller items is complete by itself and reads like a short article.

**Change Number Two: The Strataform Page.** Don't you just love the word "strataform"? We decided that was the best word to describe the page design, which comprises three bands, or strata. The design is necessary to accommodate the modules in a way which will not threaten the peace of mind of the diggers. A feature article most often occupies the center stratum and it stays there page after page. Very predictable. The modules spring up along the way in the other strata, wherever they seem to be relevant. We are adding special lines to the design which will help your eye stay put where you want it to, but which will also tell you when an illustration supports material in two different strata at the same time. Yes, it might take an issue or two for you to get used to it, but you will ultimately find that you like it better than conventional page design, whether you dig or dip. It realizes science fiction's two important goals: to be rational and predictable while being full of surprises.

**Change Number Three: Graphics and Visual Material.** The new *Galaxy* has more pictures than it ever did. We are not substituting pictures for text, but we think pictures can be a very important part of your understanding. And as I noted above, we are placing the pictures in a way that makes their relevance immediately

apparent. In addition, we are able to use the new page design to great effect in the illustration of the fiction. Each story has at least one illustration to go with it. We are allowing the artists to design the illustration pages themselves, within the established page grid. This approach has a couple of advantages: it makes the pictures interesting, since they are shaped to emphasize the subject, and it keeps the artists happy.

**Change Number Four: Content.** I already mentioned our feature articles. Science editor Ed Teja and I are doing a lot of searching and planning to make sure that *Galaxy* brings the future into your lives in many ways. In addition to a new emphasis on non-fiction, you will notice changes in the fiction as well. The most dramatic change is that it is all pretty short. We are breaking *Galaxy's* long-established policy of serializing longer works. We would like to hear from the readers on this subject, but I have a feeling that most of you will prefer getting almost all short fiction. It gives us flexibility and variety. Magazine editors know that it is easy to fill an issue (or a run of issues) by serializing a novel. On the other hand, the structure of the new *Galaxy* calls for building, rather than filling, each issue. The short stories you find in these pages are selected, not only for their quality, but for the specific mix they provide in tone, subject, and mood.

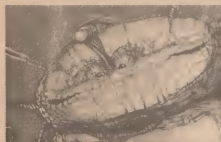
So there you have it. *Galaxy* is a new magazine now. Each issue is crafted around the three concepts of science, science fiction, and science fiction commentary. Within each department you will find both unity and diversity, both depth and variety, and a commitment to the future. Welcome to a new era.

-Floyd Kemske

# Galaxy

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# Galaxy is back....



...and to say it's bigger and better than ever seems pale compared with our enthusiasm. We have increased the size from traditional digest to the more dramatic 'Galileo' size, but we've gone back to the cover design *Galaxy* made famous in the 1950's. We've enlarged the editorial scope with an aggressive science department covering areas like personal computing, jobs of the future and how to prepare for them, the young movers and shakers who are inventing our future right now, and 'Question' — probing the problems before they happen.

Splendid illustration and graphics enhance the kind of original Science Fiction which made *Galaxy* the most popular publication in the field from the time it was born 30 years ago. And we're putting all this in a radically new format inside, unlike any magazine you've ever seen before, because *Galaxy* is not only a magazine ABOUT the future, *Galaxy* is the magazine OF the future.

And we have a special offer for those who want to rediscover the magazine which set the standard for Science Fiction. In 1980, every subscriber will receive the *Gala 30th Anniversary triple issue*, featuring some of the greatest authors in Science Fiction, cover priced at \$3.95, at no extra cost.

Use this coupon to get the next five regular issues of *Galaxy* plus our fantastic 30th Anniversary **triple issue** for only \$7.50. Subscribe today and don't miss an issue of the new *Galaxy*.

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# You'll Never Find It in Galaxy



TIME QUARRY—A Suspense Novel By Clifford D. Simak  
CONTEST—STARTLING PRIZE—Introduced To WIRE UP

The first issue of *Galaxy* appeared in October, 1950, and sold for twenty-five cents. Assembled by the legendary H.L. Gold, this first issue had a radically new cover design and 160 pages of outstanding fiction, features, and articles. The back cover was an advertisement, written by Editor Gold, titled "You'll Never See It In *Galaxy*." We are ruining this famous ad in lieu of a letters column for this issue.

Jets blasting. Bat Durston came screeching down through the atmosphere of Bblizznaj, a tiny planet seven billion light years from Sol. He cut out his super-hyper-drive for the landing... and at that point, a tall, lean spaceman stepped out of the tail assembly, proton gun-blasted in a space-tanned hand.

"Get back from those controls, Bat Durston," the tall stranger lippled thinly. "You don't know it, but this is your last space trip."

Sound alike? They should—one is merely a western transplanted to an alien and impossible planet. If this is your idea of science fiction, you're welcome to it. **YOU'LL NEVER FIND IT IN *GALAXY*!**

What you will find in *Galaxy* is the finest possible science fiction...authentic, plausible, thoughtful...written by authors who do not automatically switch over from crime waves to Earth invasions; by people who know and love science fiction...for people who know and love it.

## YOU'LL NEVER SEE IT

### IN *GALAXY*

jets blasting. Bat Durston came screeching down through the atmosphere of Bblizznaj, a tiny planet seven billion light years from Sol. He cut out his super-hyper-drive for the landing... and at that point, a tall, lean spaceman stepped out of the tail assembly, proton gun-blasted in a space-tanned hand.

Durston: the tall stranger lippled thinly. You don't know it, but this is your last space trip.

Hoofs drumming. Bat Durston came galloping down through the narrow pass at Eagle Gulch, a tiny gold colony 400 miles north of Tombstone. He spurred hard for a low overhang of rimrock... and at that point a tall, lean wrangler stepped out from behind a high boulder, six-shooter in a sun-tanned hand.

Bat Durston: the tall stranger lippled thinly. You don't know it, but this is your last saddle-jaunt through these here parts."

Sound alike? They should—one is merely a western transplanted to an alien and impossible planet. If this is your idea of science fiction, you're welcome to it. **YOU'LL NEVER FIND IT IN *GALAXY*!**

What you will find in *GALAXY* is the finest possible science fiction...authentic, plausible, thoughtful...written by authors who do not automatically switch over from crime waves to Earth invasions; by people who know and love science fiction...for people who know and love it.



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# SCIENCE FICTION TIMES

## FANTASTIC COVERAGE

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- Book reviews
- Publishers
- Small press
- Reviews of magazines
- Fanzines
- Art books
- New artists
- Collector's best buys
- Writer's markets
- Records
- Games
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- New Comics
- Comics reviews
- SF shops
- People profiles
- Interviews
- SF fan clubs
- SF organizations
- SF study courses
- Writer's workshops
- History of SF
- Literary perspectives
- SF glossary
- Convention calendar
- Convention news
- Films in production
- Film history



## NEW PLANET FOUND SCIENTISTS PUZZLED

Where do science and science fiction converge. SF is not a prognosticator. Its spirit is to question, and this is the spirit of science as well. All that risks must converge.

## SCIENCE INTERFACE

We can't cover science too, but we can let you know who is, in our special article referral service for keeping up to date. Whether you're an editor or a writer, you need to know the latest findings.



## JACK KIRBY AND DISNEY TEAM-UP FOR *BLACK HOLE* IN FULL COLOR

Beginning with issue #6, the *SFT* will present the complete, uncut *BLACK HOLE* serialization in full four color. Disney Studios decided that only Jack Kirby, the master of comic strip art, could capture the dynamism and scale of the film. The multimillion dollar science fiction spectacular will comprise 26 episodes which will run four at a time, with special white offset stock for the color pages for collectors.

## ARTISTS DISCOVERED IN STRANGE CIRCUMSTANCE

New SF artists are presented—a showcase for public recognition when they need it most.

## STRANGE HAPPENINGS: AUTHORS QUESTIONED

What would you ask your favorite SF author? We're giving you a chance in a special forum—no holds barred. Send the questions to us.

## AD PRICES DROP

Because we'll over 10,000 copies of the *SFT* will pass through the hands of over 20,000 SF readers on every issue, the *SFT* is a unique bargain for the advertiser. Ask for more information if there is something special you want to do. From classifieds at ten cents per word to full page display ads for only \$100.

## SF NEWSPAPER OPENS NEW FIELD OF INQUIRY

The question must be asked. Why an SF newspaper? Simply put, Science Fiction is no longer a ghetto-genre enjoyed by a small cult of enthusiasts who come together at conventions to talk shop. It is as field of international, intercultural importance which is shaping the very future it imagines. No longer just a toy, it is now the place where things are truly happening, from literature to the movies, from the laboratory to the mountains of Mars. Science Fiction can still be loved by its fans, but it has new responsibilities as well. SF has come of age.

## SCREENPLAYS PLAY IMPORTANT ROLE

Serious attention is given to a subject which is shaping SF as surely as the traditional forms of science fiction writing.

## LOW PRICE WON'T LAST

We are introducing the *SFT* at such a low price just to seduce the readers who don't think they can get their money's worth. *SFT* will sell for \$1 per copy after this introductory period. Subscriptions will be \$12 per year, but we're offering it now for only \$6. That's fifty cents an issue, and if you decide it's not right for you, we'll refund your money. Keep your first two issues, no questions asked. The *SFT* is for those who work, read, watch, listen or write Science Fiction, and love doing it. No one else.

## NEW STORY TOLD OLD WAY

Reviving an old newspaper tradition, *SFT* is running at least one story per issue.

## COMIX COMEBACK

What price Superman? Are there any newcomers worth watching? Is there a renaissance in SF comix?

## WEIRD WRITERS MARKETS OFFER ODD PAYMENT

What are the editors buying? What are their restrictions?

## SF SHOPS BOOMING

How does one start an SF shop, and what to do once you have. And where to find the SF shop nearest you.

## VIDEO REVOLUTION

The video field is finally blossoming with individual dreams and endeavors far beyond the control of networks and government restriction.

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# Son of Calculator and the Electronic Lifestyle

by Steve North

*Personal computing has been in your immediate future for some time now. Here's what it will mean when it finally arrives*

**R**ECENTLY A FRIEND remarked that at the 1964 World's Fair he was told that by now he'd have his choice of living on the moon, in a domed city under the sea, or in a space colony. It seems that those predictions don't match the present reality. Attempting to predict the future is almost always an invitation to failure. Because all things are interrelated, a critical factor that affects the prediction goes overlooked. Nevertheless, it's hard to resist the temptation to speculate on the future of personal computing. It does, after all, have the potential of affecting our lives more dramatically than previous inventions.

Inventions such as the telescope, microscope, automobile, telephone, sound recordings, and television have all made drastic changes in society's growth. All these devices expand our capability to see, hear, walk, and communicate—they expand our senses and sensibilities. Unlike any other tool, however, the personal computer can increase the power of the mind, not just the body. Of course, this sounds fanciful when you look at home computers used to play Star Trek and blackjack, but the revolutionary potential still exists. We must learn the right way to use the computers.

## THE EVOLUTION OF A REVOLUTION

Internally a personal computer is a cut-down version of a big computer. In fact, the only difference between the home computers and their hereditary brethren is that they are smaller (about the size of a typewriter), a little slower (depending on what you use them for), and much less expensive. The hypothetical line separating large computers from small ones is fading. Thus, home computers are often scale models of large commercial systems—a sort of

model railroad for the computer freak. This isn't necessarily the best way to design a computer for people, however. Commercial systems are made to maximize the computer's efficiency, not the power and flexibility available to the people who use it. These systems are machine oriented; home computers should be people oriented.

The programming languages for personal computers have nearly all been running on large computer systems for the past ten or fifteen years. Although computer science is generally believed to be progressing at lightning speed, the state of the art in computer software (programming languages and programs themselves) doesn't keep pace with hardware developments. The ways in which people interact with computers have changed little over the years. Indeed, because of the difficulty people have in changing computer programs

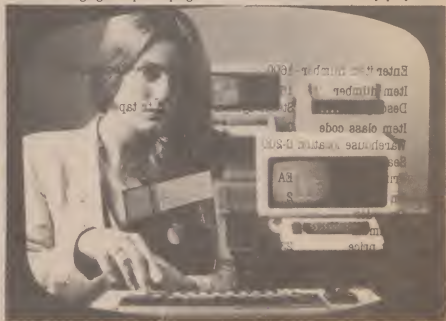
(and using the existing programs) it becomes increasingly difficult to popularize major advances in computer software.

The factors that made personal computers possible were both technological and economic. It can be hard to separate the two. The technological breakthrough that started it all was the microprocessor—it put all of a computer's central processor on one small piece of silicon. The economic factor involved economies of large-scale production; an entire personal computer system that costs a few hundred dollars right off the shelf makes quite an attraction.

## WHAT IS A PERSONAL COMPUTER?

A typical personal-computer system looks like a terminal with a keyboard and video-screen; it costs about \$1000. Some systems (such as Mattel's new system) hook up to your television set to save you the cost of buying a separate video monitor. Almost all systems offer a version of BASIC—a beginner's programming language developed at Dartmouth in the 1960s and later improved and expanded for general-purpose use. If you don't want to write your own programs, some manufacturers sell pre-programmed cassettes that handle common applications such as game playing, engineering and statistical calculations, home-budget management, and investment analysis. But if these "canned" programs don't suit your needs, you can learn with only moderate anguish to write your own.

Personal computing now has a status similar to that of amateur radio about the time that commercial broadcasting first began, or that of a car owner back when there were few good roads and all drivers had to be mechanics. Many people who





buy personal computers don't have a clear idea of what it can do for them when they take it home. Obviously, computers have many good applications, but some don't justify the expense of hundreds, or thousands, of dollars. Ed Judge, of the Tandy Corporation, manufacturer of more than one out of two personal computers, says, "I don't think that anyone really knows why people buy home computers. That's the \$10,000 question. I think most people buy our computer for self-education. They want to learn how a computer works."

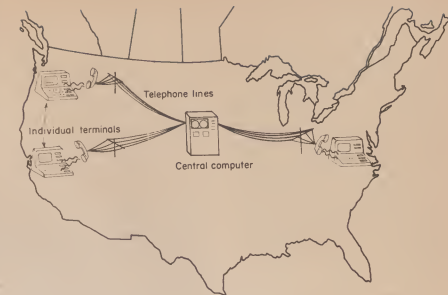
### LOOKING AHEAD

**T**HE PRESENT TREND is toward faster, smaller, more powerful personal computers with very fine-resolution color displays (clearer pictures on the monitor) and a wider selection of preprogrammed cartridges that suit home applications, computer-based instruction (to help children in school), and games. BASIC will remain an important computer language because of the large number of people already using it, but it will eventually be supplanted by a more powerful language. BASIC forces you to examine problems in a sequential, step-by-step manner—it isn't a true problem-solving language. More advanced languages encourage breaking up big problems into smaller ones that can be, in turn, broken down into small calculations which a computer can easily be programmed to handle.

Talking, listening, and music-playing capabilities will also appear as standard features on computers within the next five years. You will be able to compose sonatas or learn to read music with your computer. It will respond to verbal orders. The computer won't be able to understand speech, of course. There is a big difference between capturing, matching, and reacting to the wave patterns of a restricted set of sounds, and actually understanding the meaning behind them. In this way computers are (and will remain) smart machines rather than a new form of sentient intelligence.

Preprogrammed cassettes or cartridges will be sold in the same way that books and magazines are now. For special-purpose applications you will need to know how to write your own programs, but there is no more need for the average computer user of the future to be a programmer than there is for the stereo user of the present to be an audio engineer.

It isn't clear whether the growth of personal computing will be gradual or explosive in the near future. This depends on such events as the introduction of low-cost hardware (\$1000 is still not cheap) and plentiful software. Computer manufacturers also have their



Noelle Barnett

hands full educating potential users to the advantages of owning their own computers.

### COMPUTER NETWORKS

When several people own computers, they inevitably begin trying to find ways to hook them together to share their programming and data-collection efforts. Such a hookup is known as a network.

Stephen B. Gray, founder of the Amateur Computer Society, says, "I think the phone company will eventually get into the act. The easiest thing would be for them to give you just the bare minimum of hardware—only a screen and a keyboard—and for them to own a large computer with a library of programs. Then, whenever you need a program, even if it's just once in a lifetime, it will be there in the computer, waiting for you



## Movers and Shakers

**W**HEN THE microcomputer industry began its first hesitant steps as a new market, much of the energy was put into it by well-meaning hobbyists, overly enthusiastic computer fanatics, and ripoff artists. Amid this chaos (and if you went to any of the early computer shows, you know that chaos is an underestimate) Adam Osborne sounded a clarion call. He began a refrain that he is still sounding, pointing out that the microcomputer industry had to become aware of the realities of business in order to survive. He insisted that the survivors would be few—and battle-scarred.

These weren't hollow words. Dr. Osborne was in the business himself. Starting with his own consulting firm, he moved into the publishing business where he initiated the concept of giving away computer programs and selling books. Traditionally, computer programs

were high-priced items and jealously guarded. Convinced that the necessarily low price tag of microcomputers made that unrealistic, he put his programs into book form and sold them at book prices. He realized early in the game that selling information instead of software "products" benefited everyone, and suited the new industry.

The strategy must have been successful. McGraw-Hill bought out Osborne & Associates last year, converting Dr. Osborne's company into a separate book division of the parent company with Dr. Osborne as its head. Why fool with a winning strategy?

In addition to keeping his own house in order, Dr. Osborne began speaking at seminars (held at computer shows) on the needs of the industry. He began a column ("From the Fountainhead") each month in *Interface Age* in which he discussed problems that buyers have with

to pull it out. Present laws prevent the phone company from offering data services, but the laws can always be changed."

A widespread network would allow instant access to other things besides computer programs. News reports, stock quotations, magazines, encyclopedias, entire libraries, and perhaps even films and art works would await you. Instead of skimming through a newspaper to find the news that interests you, you might be able to type into your keyboard, "What happened at the SALT talks today?"

Computer scientist Ted Nelson, an early proponent of personal computing, has developed an "electronic literature" that can be represented only on a computer's video screen. His text, called Hypertext, isn't always linear. It combines a variety of sequential and parallel relationships in the text. In a regular book, you start at page one and read through to the end. With Hypertext, you can freely explore relationships between different sections of the book, or even between one book and another. For example, where a textual passage is quoted, a "window" on the screen shows you the quoted section of the second work. By manipulating this window, you can see the context of the quote and relevant information. More powerful relationships between texts let you consider a body of writings on one topic

Personal-computer networking could threaten the postal system's existence. You could compose and edit a letter, then send it to someone anywhere else on the network within seconds.

as a whole rather than as discrete packages of information.

Personal-computer networking could threaten the postal system's existence. You could compose and edit a letter, then send it to someone anywhere else on the network within seconds. You could, of course, make a phone call instead, but this way you could transmit documents. Such networks also lend themselves to sophisticated, multiplayer games. It wouldn't be difficult to imagine games of chess, bridge, or monopoly that spanned thousands of miles due to computer networking. The next step, the mind-blowing step, is when the computer becomes an active participant in the game. One of the most challenging (and additive) computer games yet devised is a fantasy game called Adventure. Present versions of this game allow one person to

search for treasure and adventure in a small world simulated inside the computer. The computer acts as the player's eyes and hands, responding to English commands such as TAKE AXE or UNLOCK DOOR or GO NORTH. The computer might say, "I'm in a small room. There is a screwdriver here and a locked door." The player could issue commands to unlock the door (if he has keys) or pick up the screwdriver. He might tell it to try to force the door with open with the screwdriver. The properties of the objects in the game and the effects of various actions are fixed in advance by the programmer. Each game has at least a few hazards and rewards. In short, Adventure is a super puzzle.

Imagine a dynamically changing version with several players, each with their own keyboard. The players could help (hinder) each other or exchange messages.

A few primitive computer networks already exist—mostly they are in the form of electronic newspapers and two-way cable television. Although they constitute significant advances, they let the user interact only in a limited way. What is required is not only the network's existence, but also computer programs that help you choose from among the large amounts of data and programs in an easy-to-use manner. It is likely that the realization of computer networks will come from extensions of cable television, telephone, or other communications networks rather than from developments in personal computing *per se*. Personal computers available offer little compatibility or standardization.

### THE ULTIMATE PERSONAL COMPUTER

Ideally, a personal computer should be inexpensive, portable, and highly interactive. It should be something you can carry around and use in your daily life as easily as you do a notebook and paper. It should plug into a computer network at work or at home (perhaps over a telephone), or function independently. It should be simple to use—almost obvious. This last, however, might prove an unattainable goal. Many people believe that computers can be as easy to use as televisions and electronic games. While it is true that good application programs make the computer simple to operate, at the same time they don't put the full potential of the computer at your disposal. If a computer is a tool for expanding the mind, then controlling it will require thinking. The fantasy that computers will think for you is dangerous and false.

A computer can simulate the stock market, a solar-energy system, or the game of bridge. If the program is written with a human player in mind, it can be

sellers, sellers have with buyers, software vendors have with hardware vendors, and so on. He has tackled every important problem from the protection that a vendor has against bootleggers who sell unauthorized copies of their software to how to get your money back from a mailorder distributor who doesn't send you what he advertised.

In order to remain effective, Dr. Osborne has remained accessible. People who go to computer shows, get involved with manufacturer's groups, or other professional activities see him frequently. He's too tall to hide in a crowd, besides, he's usually talking to people in front of a banner proudly proclaiming "Osborne & Associates". When he isn't talking to people, he seems to be taking orders for more books.

Although Dr. Osborne has focused primarily on making microcomputers acceptable as small business exchange systems and ensuring that the manufacturers were up to the challenge, his influence reaches everyone in the micro-computer and personal computer marketplace. His books introducing readers to understanding microprocessors have become classic reference books and have gone through many printings. If there was ever a case of a cash register testifying to a man's success, it's so with Adam Osborne.

The exciting thing about observing a



person such as Dr. Osborne is that he created the role he plays from whole cloth. He isn't a consumer or industry advocate, but a participant with a critical eye who finds truth on both sides of the fence. He has made a career of making astute, constructive observations. Now if we could only clone him to do the same for the auto industry...

—Ed Teja

interactive and enjoyable to use. To develop the playing strategy for the simulation, however, the programmer must work long and hard, testing and refining the routines. Running a stock market simulation might be "ridiculously simple," but creating an accurate model of the stock market is not. To fully use the computer, you cannot remain a passive operator. Therefore, the concept of the "ultimate all-powerful ridiculously simple virtual extension of your own mind" may be nothing but a myth.

It is still valid, however, to talk about the ultimate personal computer. It would have an optimum size that coincides with that of a notebook. Anything larger would be difficult to carry around. Anything smaller, such as a wristwatch-sized computer, couldn't provide reasonable text and graphics display. The computer must have high-quality graphics for showing diagrams, pictures, or even animated cartoons. (Imagine directing your own movie with computer-generated actors and backgrounds.) The computer should have a touch-sensitive flat screen, or a standard keyboard, or both, as well as audio inputs and outputs for music and speech. It needs a massive internal memory that can store hundreds of books, films, letters, receipts, songs, and simulations.

#### SO HOW LONG DO WE WAIT?

Curiously enough, most of the components for our idea are within our current technological grasp. Touch-sensitive displays, flat screens, and high-capacity memories are being refined and made less expensive to produce. Researchers at Xerox's Palo Alto, California, research center have developed a proposal for a "Personal Dynamic Media," called a Dynabook, that is a version of the computer we have defined. According to its original description, the Dynabook should be "no larger than a notebook; weigh less than 4 lbs; the visual display should be able to represent at least 4000 characters with contrast ratios approaching that of a book; dynamic graphics of a reasonable quality should be possible; there should be removable local storage of at least one million characters (about 500 book pages) traded off against several hours of voice and music files."

According to John Lees, a computer scientist at the University of Michigan, "The Dynabook concept had the potential to attract a great number of society's institutions. Look at what will be affected by the widespread use of Dynabooks, particularly in networks, via phone lines or cable television. For correspondence (and the postal system) the Dynabook has the capabilities of a typewriter in a smaller, more versatile, package. In publishing, the Dynabook is a personal

printing press. Your textbooks can be a memory file. Your family can receive its newspapers on a reusable file, its monthly magazines on another reusable file. In education, the new learning activities possible are boundless, and they depend less and less on dedicated school facilities. As for calculators, televisions, and radios, all would face a very stiff challenge. Television in particular would be in trouble—who's going to watch poor television programs when they can link up with the other kids on the block for a game of really super Star Trek or Star Trader? The possibilities boggle the imagination.

The Dynabook concept is the culmination of many mind-expanding applications for a personal computer, brought together into one compact unit. The appearance of portable personal computers like this isn't far off. The heart

of the system, highly developed and interactive programs, aren't ready yet, however. This means that you can't expect to see anything as versatile and fun as a Dynabook-style computer until long after the advent of such comparatively simple advances as hand-held BASIC-speaking computers.

The personal computer's ultimate purpose isn't to help balance your checkbook, remind you when to change your engine oil, turn thermostats up or down, or provide instant stock quotes. These and most other common prophecies of personal-computer applications are trivial and irrelevant. The most important service the personal computer will provide is to improve your life, and help you ask "what if?" For further details, watch the next ten years!



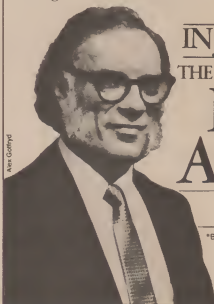
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\*Bob McCoy, *Future Life*, on *In Memory Yet Green*

● DOUBLEDAY

# Your Car and Its Computer

by Ed Teja

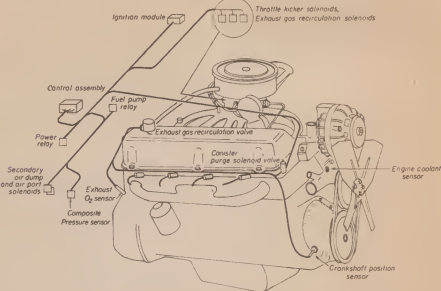
**H**AVING TROUBLE WITH your 1999 juggernaut? Why not pull into the station off to the right and have its programming checked? You know your car's computerized system is subject to a lot of wear, and its internal adjustments can only compensate for so much variation in performance. And did you ever consider the number of things that the on-board computer is responsible for? Unlike the cars of the 70s and 80s, which used a computer only to optimize the ignition system and fuel flow through the supercharger, today's models put nearly every automotive function under computer control.

Consider the dash-mounted breath analyzer, for example. Before they became mandatory accessories, even drunks could start a car. All they needed was a key! Your car is too smart for that. Anything that indicates that the driver has had more than the legal limit of drinks locks out the ignition system.

You don't think about it much, but before cars came equipped with low-cost photocells people had to turn on their

headlights when it got dark. Of course, dark meant different things to different people, so sometimes some cars would have their lights on, while others had them off.

Driving back in the 80s was completely manual, other than for a few simple-minded gadgets, such as cruise control. The so-called power and automatic devices weren't really. It was actually possible to drive with the front of your car



Norman Barnett



## Words

Before you can talk computer—which is similar to talking turkey, if you're a turkey farmer—you have to know the lingo. Here is a glossary of terms you'll need to know when you start to haunt the environs of your local computer club or subscribe to a computer magazine.

**Alphanumeric**—represents both letters and numbers; as opposed to alpha-only or numeric-only devices.

**ASCII**—An acronym for the American Standard Code for Information Exchange. It's a 7-bit code that represents letters, punctuation, and control codes.

**Analog**—a continuous signal, as opposed to discrete digital signals. Audio from your hi-fi is analog; computers comprehend digital only.

**Analog-to-digital conversion**—called A/D conversion, or just ADC, the process that makes continuous signals comprehensible to computers.

**Assembler Language**—a computer language that produces machine instructions. **BCD**—a binary-coded decimal; a 4-bit code for the numbers 0 through 9.

**Benchmark**—a test program used to compare computers' relative speeds.

**Bit**—a single digit of binary (base 2) number.

**Bus**—a set of hardware lines used to connect several devices together, thus you will hear of an address bus, a data bus, and so on.

**Character**—an information element. The letter "C" is an element of the alphabet, thus it is a character of that alphabet.

**CRT**—cathode ray tube. A display device that uses the same technology as your television, whose screen is in a CRT.

**Digital-to-analog conversion**—the reverse of ADC.

**Direct Memory Access [or DMA]**—an input/output technique for transferring data between a peripheral device and memory without using the processor.

**EPROM**—Erasable Programmable Read-Only Memory. A device for storing programs or data that will be needed for some time.

**GIGO**—Garbage In Garbage Out. The most common failing of computer programs.

**Hardware**—the system's circuitry.

**High-level language**—such as PASCAL, BASIC, or FORTRAN provides a way of

writing complex programs easily. Each instruction provides more than one machine instruction.

**Input**—transferring information into the processor or memory.

**Interface**—the circuitry (or software) that goes between two devices or processes to ensure that they work smoothly together. **Interrupt**—a disruption of the expected program flow.

**Machine code**—instructions understood and executed by the processor.

**Nybble**—half a byte, or four bits.

**Object code**—code written in machine instructions.

**Output**—transferring information to the outside world.

**Peripheral**—a device that is connected to the processor in order to work with it.

**Random-access memory**—temporary storage devices. When you turn the machine off, anything stored here goes away.

**Register**—where the processor tucks away bits of information.

**String**—a group (flock?) of characters that, taken together, have some meaning. The characters (letters) that make up a word constitute a string.

This far-from-complete list should get you started in wading through the literature. Don't worry about learning the terms; worry about using them correctly

at an unsafe distance from the rear of the car on front of you. No on-board navigators existed. A large number of accidents resulted. Humans couldn't calculate safe stopping distances, taking into account road conditions and the car's condition and speed, as accurately as today's computers can.

Drivers had to navigate by reading street signs. Because there weren't any on-board computers, there was no practical method of implementing sophisticated traffic-flow systems. Siemens Corp had worked out the details for microwave transponders that identified and assisted cars and drivers way back in the 70s; they planned car-borne responder units that could run indefinitely on solar cells. Initially the system was intended for short-haul dispatching centers, ambulance services and police and fire departments. It didn't take long for auto manufacturers to catch on to the commercial possibilities. They took the legally required anti-collision devices back to the drawing board to add the full navigational capabilities that now come standard on the lowest-priced model.

Today, of course, every major city has a traffic-control computer that finds you the quickest, least congested route to your destination. It monitors your individual progress past its transponder checkpoints. The auto-identification system also has reduced car theft dramatically.

Today's car thief needs to know as much about computer programming as he does lock picking.

There was a time when you knew something was wrong with your car when it began making terrible noises or stopped running. Adding diagnostics was a trivial job for the auto designers once computer control was established, but it was a tremendous leap for auto owners. Now you get advance warning. You can have your car repaired when a two-dollar

part begins to go bad instead of when the two-dollar piece lets loose of the \$400 part, destroying the \$600 part under it.

The really nice thing about computer-controlled diagnostics is that they operate automatically. By paying attention to the early warnings about mechanical inefficiencies under the hood, you can save the cost of all of this electronic magic in repair bills over the life of your car.




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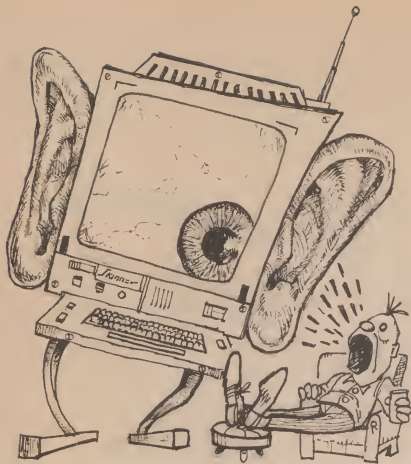
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## If You Don't Talk to Your Stereo, I Will

by Eric Blair

**O**UT OF JAPAN COMES the first exciting development in stereo and television for quite some time. At the Winter Consumer Electronics Show (WCES), Toshiba America, Inc. showed its prototypes of the appliances of tomorrow—devices that respond to their owner's voice.

The new units feature an Acoustic Remote-Controlled System (ARCS) that provides this hands-free, voice-operated

## Defending the Empire: Intelligent Games

by Ed Teja

**O**NCE UPON A time, when someone made up a game, the paraphernalia required to play it might include some chalk marks on the pavement, a rock or two for markers, and the odd bit of string. The focal point of these games was frequently found in contests of manual dexterity—someone, somewhere, tried to outmuscle, outwrestle, or otherwise overcome or overwhelm the opposition. Today, if someone tells you they just made up a game, it's likely that to play it you must sit in front of a video display defending your side (often referred to as "the empire" rather than the archaic "good guys") against the machinations of a human opponent or, somehow more diabolically, a computer.

The heritage of computer game playing can be found in a branch of computer science called "simulation." The idea behind simulation is that the

problems that decision makers must face in the "real world" can be approximated with a computer. You get a chance to try out various strategies to see which will be the most effective when the time comes to make the final decision. Thus, the point of simulation is actually learning—learning specific skills. In order to try out the alternative strategies, a programmer creates a "model" of the situation. He maps out the cause-effect relationships that exist and approximates the conditions that will exist when the decision must be made.

### PLAYING FOR KEEPS

The Pentagon is a bastion of game players. Countless tax dollars support a massive simulation that tracks the ever-changing character of the world's potential for a nuclear-type World War Last. They play with big chips.

To begin modeling such a situation, the programmer must have a good evaluation of the current situation, and an idea of the relative importance of various items that make up the model. While you'd get the best results by leaving absolutely nothing out of the model, you'd also never finish making it. Thus you must eliminate those things that have the least effect on the model's performance. What kinds of things? All kinds of things. You could probably expect that the altitude of Paris hemlines would have a minimal impact, but don't count it out without some research. (This game stuff sounds like work.) For our world war model, the location of ICBMs (and their payloads) plays an important role. Not weighing things carefully can prove embarrassing. An interesting (perhaps apocryphal) story has it that the Pentagon set about to use the model to determine what single resource was the most vital in time of war. The bills of materials for all essential goods were fed into the computer. The requirements of the nation were checked and counterchecked. After much wailing and gnashing of teeth (on the programmer's part—computers don't have teeth) the results were out. Paint. Paint was the common element to the national defense. Someone forgot to mention to the programmer that not all materials were equally important. Talk about learning.

remote control. The stereo memorizes (during a training period) and responds to its owner's voice by analyzing the voice's characteristics and matching its analysis to the patterns stored in the training period. Computer control (an eight-bit microprocessor, to be precise) provides comprehension of seventeen words that result in twenty-one different operations that range from turning the unit ON and OFF to controlling the cassette deck's operation.

The voice-actuated television responds to thirty words, if you count the numbers 1 through 12 as words. The set beeps when it hears a command that it understands—just to let you know that it heard you—and it flashes a light-emitting diode (LED) when it gets confused.

Notice that the "look" of the 80s, at least as far as stereo systems and televisions is concerned, isn't really a new appearance. It's a new man-machine interface. Don't expect appliances to change too much externally for a while, either. They keep getting smaller, but there are limits to how small they can get and still be useful. It's already quite a chore for designers to get all the necessary knobs, dials, meters, and lights on the front panel and still leave enough room for fingerprints. And now you'll have to have enough space for a microphone. The system does need ears, after all.

But the model has its uses. Suppose a general wants to know the actual decrease in deterrent capability that will result from a budget cut. His first task is to define deterrent capability. Are offensive weapons of deterrent value? Do ten ICBMs equal fifteen jet fighters? If he can answer questions such as these, he will get an answer—based on those premises. The model is only as good as its inputs. In programmer lingo—GIGO, garbage in, garbage out. The model can have as many levels of complexity as needed, but there are practical limits. The model must be understandable, or it is worthless. That's one of the nice things about games. The policy of "Keep It Simple, Stupid" (KISS) applies to computers perhaps even more than anywhere else.

But enough of the dire mutterings of the Hawks. What about the good clean fun? Let's look at the scenario for a run-of-the-mill Star Trek game written by a group of wayward engineers a few years back.

#### THE FINAL FRONTIER AND THE LAST STRAW

To play Star Trek, you need a universe ripe for exploration. Because a universe isn't an off-the-shelf item, our program created one. Using number arrays (called matrices), we defined known space

Adding intelligence in the form of a microprocessor opens new horizons for appliance designers. You'd expect that a computer controller inside the system would do more than just interpret a human's commands. That has been the trend. Look at all the goodies that have been added onto microwave ovens since they were computerized. They even tell time and give cooking advice. The important question is, however: What would you want the computer to do? Stereo components are already quite sophisticated. Some jobs the microprocessor would be extremely good at, such as working with the tape transport to control braking and tape speed to take better care of the tape and ensure

constant tape speed—furnishing better performance. The better tape decks come with built-in microprocessors for that very reason. They don't need another one.

Besides, if you like the idea of a separate-component stereo system, you don't want one computer running everything. That would entail putting all the components together in a clump to avoid making your living room look like a Bell telephone exchange. That scheme would, in short order, bring you full circle back to the monolithic television-stereo all-in-one. When the stereo breaks, the whole mess goes into the shop for six years (the technician has to retrain for computer repair).

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On the other hand, there might be a market for a central controller unit. The controller unit would be a separate component. It wouldn't play music, change records, or perform any useful service (except maybe tell time)—by itself, that is. Ah! Now you could plug in a tape recorder and amplifier to make a complete voice-controlled sound system. You could give the intelligent

controller a command, such as, "Stereo power ON at 2:30 P.M. Patch tape deck output into amplifier unit. Tape deck to play in stereo. Volume at level one. Stop tape deck at 3:30. Power OFF." Hey that would be handy! Now you can be greeted at the door by your favorite music. Tie the system into a burglar alarm to greet unwanted guests with the 1812 Overture played slightly above the

threshold of pain. (You'd better have a good system for that.)

Our theoretical controller would be extremely flexible. To add components to the system, you'd just plug them in and teach the controller a few new commands. The controller functions as a power controller, patch panel (connecting one device to another), and function controller. The better units would even turn off any components not being used to save energy and wear and tear on the system. The controller units could run tests (called diagnostics) on your stereo for you periodically. Computers test themselves, why not apply the technique to your stereo? This kind of function suits a microprocessor's capabilities.

At this point you might have noticed some similarities between our hypothetical controller and Steve North's personal computers. Yes, it's true. A personal computer with the addition of some hardware and software would fill the bill. The point of all this is that your first computer might not come in the shape of a computer—it might look like a stereo. A dedicated controller would be cheaper than most computers. It wouldn't need a display, a complete keyboard nor as much memory. It wouldn't need to be programmable. That doesn't mean it wouldn't be a computer.



in quadrants. Inside each quadrant sat more arrays, which defined sectors. Rather than let the *Enterprise* exist just anywhere, we gave her a choice of sixty-four locations within each sector. This limit kept the math manageable—a serious consideration in any model.

Next, we needed Klingons (AKA bad guys). We let the computer pick a number between ten and one hundred to represent the number of Klingons in the known universe. We didn't care about the unknown universe, we weren't going there. The bad guys were spread liberally throughout the universe (along with stars and starbases). We never let there be more than five in any one quadrant, however, as experience proved that five Klingons were fatal to the *Enterprise*—always.

Thus was the universe created. Not incredibly complex, but even this simple-minded construct took a fair amount of work to get going. You can imagine what they go through at the Pentagon. The entire definition of the universe was subjective—it was as large as we could make it without running out of memory in our computer. We introduced as many variables as it could manage.

The *Enterprise* then was launched. The sector and quadrant were again selected by the computer. (The computer uses a random-number generator to pick numbers, by the way.) This started the game with a bang. In fact, every once in a while, the player at the helm (each player was his own entire crew) would be greeted by a display on the screen that read:

THIS IS STAR TREK  
YOU HAVE 53.8 YEARS TO DESTROY  
49 KLINGONS  
WARP INTO QUADRANT 7.3  
ENTERPRISE DESTROYED!!!  
Not exactly a perfect beginning.

Assuming the player made it into the first quadrant, he began seeking out and destroying Klingons. The idea was to kill all of the bad guys before the time ran out, you ran out of fuel, or they killed you. Now isn't that better than that nasty, bloodthirsty Pentagon simulation?

This digression shows you a little bit of what goes into creating a computer-controlled game. Toy manufacturers use the same basic approach, whether they make "Breakout" or an auto race game, or if they write a balance-your-checkbook program (except that Gremlins replace

Klingons in the check balancing process). But not everyone has a computer. That revelation hit companies like Mattel early on. One approach, used by Atari, was to sell you a dedicated computer (called a video game) that you could hook to the television and play. You add games by buying cartridges. Computer companies, such as Apple, favored selling you the computer, which you could hook to your television and program, and which other people would sell you games for.

The toy manufacturers didn't want to make computers. They didn't want to miss out on the computer-game market, either. After a few false starts, came the intelligent game. When these guys make a toy, they don't fool around with chalk marks and the odd bit of string. They don't try to sell you a computer. They sell you a lot of computers, each in its own plastic shell.

#### TOYLAND NEVER PARADED LIKE THIS BEFORE

**T**HIS YEAR GREETES, along with a new spring, Mattel's Flash Gordon Space Game (for one). It is a pocket-sized, self-contained computer that operates on a 9-volt transistor battery. The game, designed for one or two players, features Flash's Arborean rocket ship defending itself against attacks from Ming's computer-

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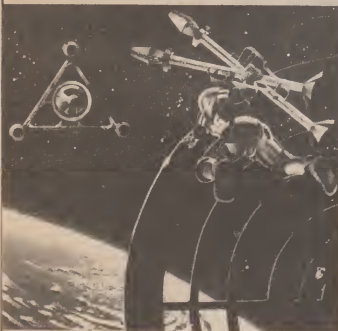
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## Careers

Galaxy looks at jobs in tomorrow's computer industry—and how to prepare for them.

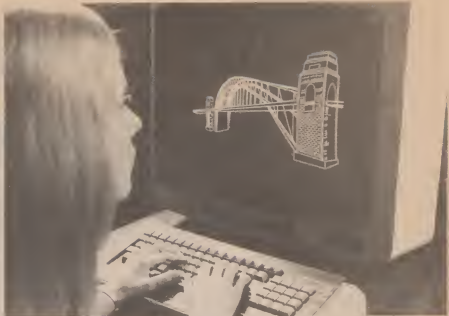
**I**F YOU'RE PLANNING to work in the personal computing field in the future, get ready for some changes—fast changes. First of all, personal computing is rapidly becoming big business, and the companies that will be in the running tomorrow will be the ones that recognize it now. Already the former garage shops, such as Atari and Apple, have moved into the big times, and their executives worry about debt financing, labor disputes, and the price of gold just like their counterparts at IBM. Large conglomerates—Exxon, to name but one—are buying up all of the small, profitable electronic companies that they can work out a good deal with. The cash it has in the bank makes a big difference in whether or not a company makes it in the long run.

But enough of the industry as a whole. You want to know what you should be studying to get into the field. Computer

science is always a good bet. Theoretically, anyway, whatever is being taught should pace current events in the real world—but don't count on it. Academic institutions tend to wander into the muck and mire of, well, academia, instead of focusing on the things you'll need to know on the job. Still, a background in computer science will give you the fundamentals to build on.

To become skilled at writing the types

of programs that will be needed by the computers of tomorrow, sharpen up your business and finance knowhow. Just take a look in any of the many magazines dedicated to personal computing (such as *Creative Computing*, *Byte*, or *Kilobaud*) and you'll see that the demand for good business programs far outweighs that for any other kind. Judging by the number of complaints coming from users, those on the market today aren't completely doing



controlled raiders. You get digital scoring, an arming switch, a guidance-control lever, and a fire-control button (obviously the most important part). All this and simulated war sounds, too.

But not everyone enjoys war games. Some of us prefer natural disasters. And what could be more natural than playing *Catastrophe*, wherein you depend on

reflexes to save you from crumbling rocks, quake shocks, and meteorite showers. You stop the meteorites by shooting them with missiles; juggling boulders in the air saves the city below you from destruction; catching bricks before they fall from a skyscraper gets you through the quakes. This also requires a 9-volt battery. And the

Germans thought that the V-2 was hot—they should've invented the 9-volt battery!

Not all games center on violence, of course. Card games (*Computer Gin*) and a *Horoscope Computer*, plus a series of sports games, round out Mattel's lineup. But, to be fair, it is the violent games that provide the challenge. Even chess, after all, is a war game. And given the lines around toy booths at consumer-electronics shows, the manufacturers are giving the public exactly what it wants. They are doing it extremely well, too. The hand-held, battery-operated games free the player from the living room the same way that microcomputer technology sprung programmers from the confines of climate-controlled computer rooms.

The advent of portable intelligent games might be just the ticket to offset the doldrums from waiting in lines and doctor's offices. If you have a plastic box full of *Brain Baffler* in your pocket, for example, you can learn while you wait. This Mattel creation will actually match wits with you. Its eight games include "Flash Word"—in which you spell out the longest word you can from computer-supplied letters with one letter changing every second, a version of hangman called "Go Hang," and other word and number skill games. This, like *Texas Instruments' Speak N Spell*, is a fun-to-use teaching machine.



the job—there's plenty of room for newcomers. That should last as long as manufacturers keep making new computers.

There is a continuing demand for newer, better, cheaper, more versatile, more specialized, and smaller computers, too. If your interests lie in the hardware field (the nuts and bolts end of the business), you wouldn't be wasting your time by studying physics. You might be the one to produce the next advance in high-quality flat displays. RCA is looking for people to do even more work on high-persistence phosphors for cathode-ray tubes. Someone has to design keyboards and integrated circuits. Someone must define the packaging, including development of lighter weight, yet stronger, packaging materials—preferably not based on petroleum.

Personal computing is even opening up some totally new horizons. Software publishing describes a new industry that supports widespread use of computers. Software publishers select, package, and distribute programs at prices that individuals can afford. They must offer a catalog of programs that satisfies computer owners' needs. The programs' authors are independent freelancers, in many cases, who receive royalties based on their programs' actual sales. To date no one has made major inroads into becoming a software-author's agent, but

Then games can teach, too? Sure. That's the principle behind shows like *The Electric Company*, so why not put it in boxes? Writing game programs for computers certainly has taught more programmers the fine points of programming than would care to admit it. Games include contingencies that the computer scientists (except those who are writing programs) haven't thought of yet. I mean, how often does an academic text address the problems inherent in getting a box of gold out of a locked room without getting eaten by the dragon guarding it? Not often, you'll agree.

One of the most important things that intelligent games may be teaching borders on the subliminal—that computers are here, and they're here to serve. By packaging them in delightful forms that entertain, the toy manufacturers guarantee the inevitable acceptance of computers as part of our daily lives. (I said that this would be diabolical.) Thus the expected "personal computer" might, for practical reasons, be a special purpose toy/tool rather than the ideal package which Steve North describes in his article (elsewhere in this issue). At least at first. Once computers have been accepted, who knows? Perhaps the specific lesson being taught by these games is simply computer literacy.

This should follow the path set by book publishing, too. Already most of the programs are written by a small number of people—at least in the commercial arena—and those authors might improve their financial position by using an agent. Royalties tend to be higher for software than for books (15% to 35%, as of this writing), but can be expected to fall as the industry matures.

If your interests lie in marketing, rather than technical, fields, personal computing offers some interesting challenges as well. Few of the computer manufacturers have reached the market with much impact. This is partly due to small advertising budgets, but ignorance of marketing strategies and usage of inappropriate techniques take their tolls.

To tomorrow's computer marketing genius the field is open for development and implementation of brand-new approaches. No company has satisfactorily answered the question "Do we sell personal computers as intelligent calculators, incredibly flexible video games, or as small-business machines?" There are as many answers as there are marketers.

The trick to planning a career that gets you aboard the personal computer bandwagon involves taking an educated guess as to where that wagon is headed, and then, in the immortal words of an anonymous cowboy, "Head 'em off at the pass!" Good luck.

—Ed Teja



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# IN THE SHUBBI ARMS

by Steven Utley  
and Howard Waldrop

**W** E STILL CALL IT the Shubbi Arms, though the Dufai long ago appropriated it, of course, and everything else, too, the Shubbi not excluded. The Arms is one of the older Shubbi combs, dating from sometime shortly after what is commonly known as the Fat-Ass Takeover and well before what is privately referred to as The Big Joke On Them. To the Shubbi, if not the Dufai, the place must look classy. Its tunnelways slope around an artificial hill like a gasket-leak from a broken motor.

The receptionist in the Arms' Red Tunnel East was your usual Shubbi flunky, a bad-tempered bozo. He filled the entrance when he saw me coming and scowled: the Dufai may have demoted his kind when they moved in, but at least he still had Terrans to harass.

"Want?" he whirled.

I repressed a groan. The Shubbi like the idea of a universal language, as long as it's theirs. Theirs sounds like an aviary with a cat loose in it. I'm okay on the whistles, but the clicks and glottal stops can pave the way to a laryngectomy in a couple of years.

"Want see Omlaf," I chirped. "Him be all specting see by. Call now all come hurry at."

"Him be no by." The Shubbi wiggled, indicating utter indifference. "All same go look all golly."

"Me do." (What a language.)

I followed as he pulled his bulk down the tunnel ramp. From behind, he looked like a small pachyderm that had been cut off at the knees and stuck on a broad, quivering base. The Shubbi are not a handsome people nor a pleasant one. The Dufai word

## ABOUT THE AUTHORS

Steven Utley has been writing science fiction since 1972, and has published it in *New Dimensions*, *Universe*, *Galaxy*, and *Fantasy and Science Fiction*. His real love, however, is cartooning, an occupation to which he increasingly devotes his time. Howard Waldrop's first story also appeared in 1972, in *Analog*. Since then he has appeared in *Universe*, *Shayol*, *Galaxy*, and *Amazing*. He conceived the original idea for "In the Shubbi Arms" and claims it is founded on the "apocalyptic visions of Stephen Foster as revealed in his songs."

for them has no phonetic equivalent in any Terran language, but it means approximately the same thing that Terrans call them: Fat-asses.

By and by, we came to a waiting chamber and another flunky, who looked me over and bloated, "Come? You be here now?"

"Wilson-man," I said, and showed him the emblem on my purely ceremonial brief case. "Be sent for."

The two Shubbi tweedled at each other for a few seconds, too fast and too high a pitch for me to follow the dialog. Then the receptionist headed back for his station at the mouth of Red Tunnel East, and the second Shubbi told me to wait while he went to fetch a Dufai. I insincerely thanked him as he lurched away. It's bad enough having to deal with flunkies; it can be a nightmare when some of the flunkies are big doughy toads, the others are big spiny blimps, and each kind would like to see the other kind staked out over hot coals. I nervously cooled my heels and calculated how much my time was going to be worth to Omlaf in terms of aggravation.

A Dufai finally came clacking and scraping up the tunnel ramp. Now I began to get not just nervous but twitchy as well. I had never before been so close to one of them, and certainly never in one of their lairs. The Dufai enjoy making a show of





refinement and have been, on the whole, marginally nicer proprietors of the galaxy than the crude Shubbi were. The Shubbi, on the other hand, did not smell like bad eggs.

"You are here to see Omlaf," the Dufai said in passable German. He was not asking a question. Dufai did not ask questions. "First iris on the left," and he pointed his third major appendage down the tunnel. The third appendage is the formal one; he might as well have used a pole.

I inclined my head ever so slightly, as one petty official to another, and walked down until I came to the iris bearing the squiggle that meant *Commandant Omlaf*. The iris opened. I took a deep breath and stepped through, into a gloomy, sour-smelling chamber full of the new commandant.

I hadn't expected to actually see Omlaf—his predecessor, they had told me, always kept himself mercifully out of sight behind a large screen during audiences. Omlaf was big, even for a Dufai, at least three meters high, with a ratio of about two-to-one side to top. He remained spread and didn't rise for me, but he did have an interested air. I tried not to gag on it.

"You are the Wilson-man," said Omlaf, "Your nest's official representative. I am so frothlike that you came."

"How pulsing of you to have me." I gave him a big grin. He quivered. The Dufai are disturbed by the thought of teeth,

which they apparently think are uncomfortable. They really don't like mouths, when you come down to it; our mouth parts move; we use our mouths to eat, to speak, to breathe, to make love; they think the whole business is vulgar.

"You are comfortable in that erect position."

"Quite," I said, and thought, Surely they must have told him Terrans contain a good many bones. "Do not trouble yourself on my behalf. I am here to serve you."

Omlaf gestured with his second major appendage, his way of acknowledging what was already obvious, then indicated a silver tray balanced atop a tripod. The tray contained small pieces of what might have been bloody liver mixed with milk. I was to help myself.

"I regret to decline," I said. "Terran metabolisms have quirks."

"You Terries have a saying. One man's meat is another man's person."

"Something like that, yes." I tried not to watch as he delicately scooped up some of the morsels in the cup of his minor appendage and popped them into some orifice or other.

"If ever you have occasion to call me here again, I must bring you a sample of a rich, aromatic, Terran delicacy. It's called

[Continued on page 23]

# THE COLONY

by Raymond Kaminski

**A**NTS. THEY WERE everywhere. Lucy found them in the pantry module where the food pellets were stored, in the catalytic stove, even in the cherished cookie jar, hand cut out of a moon rock, that Dave had given her on their seventh anniversary. And no matter how many times she scoured the kitchen with the plasma vaporizer, those little black pests kept coming back, zig-zagging over the white, teflon counter like coffee grounds that had suddenly come to life.

"We can shoot men into space, but we still can't get rid of ordinary ants," Lucy mumbled to herself as she chased them with her ultrasonic wand. The insects scurried away, lashed by silent vibrations in the air. But as soon as she turned her back, they brazenly sprinted out again.

To Lucy, it was more than just a simple nuisance, more than a poor reflection on her housekeeping, for Dave was one of those men who had advanced space travel so far in the last decade that the exploration of the solar system had been standardized to a methodical, meticulous routine. He was now coordinator of a project which regularly launched voyagers to forage the vacuum for the knowledge and the materials the world needed for further progress and growth. Yet when she complained to him about the ants, he only smiled over the rim of his coffee cup and went on reading the latest report on his precious flights.

The video-phone beeped persistently. Lucy ran, trying to answer it before it could wake Dave. He had put in another long night calculating the optimum reentry trajectory of Shuttle 4-11 which was ferrying in the five astronauts returning from a flight beyond Pluto. Man had finally stepped out of his own backyard and left the solar system, like a kid crossing the street for the first time. The weather on earth, however, didn't seem to appreciate this milestone. It refused to cooperate, and Dave had to sneak the shuttle through between thunderstorms.

"Where's Dave?" Otis Drew's grey face winced across the screen. He looked as though he could use some rest himself. He always looked that way.

"Dave's sleeping," Lucy tried to be firm. She knew it wouldn't do any good. "He didn't get home until dawn, you know."

"Tell him to be at Flight Control within the hour."

"Look, Mr. Drew..."

The face on the screen turned into a blizzard of grey snow. Otis Drew had hung up.

Lucy dreaded waking her husband. She knew he'd jump right out of his sleeping capsule as soon as she told him what

Otis had said. But Dave had to have some rest, some time to let his body recuperate. He was depending too much on his beta-wave generator to keep him awake. It would ruin his health if it went on. And he hadn't really touched her in weeks. Lucy wouldn't let him. She didn't want love kindled and kept burning by a brain-wave machine. Without it, Dave drifted off even before the preliminaries were over. He couldn't help it.

But Lucy did wake him. The job at Flight Control was a good one: it paid well and Dave seemed to enjoy the work. She made him drink black coffee in the hope that caffeine would make beta waves unnecessary. Still, it wasn't until he stood at the door and his finger found the button on the small pack attached to his belt that the color returned to his face. Only then was he fully awake.

"If you remember," she asked him, just to have something to say, "try and pick up some ant traps on your way home. Nothing else seems to work."

"Sure, Honey. I won't forget." He gave her an absent smile, a quick peck on the cheek, and then he was gone. She heard the turbines of his car scream into life, then fade into the distance. Lucy knew he wouldn't remember.

"We were well beyond Pluto's orbit when we made visual contact. I estimate the diameter of the craft to be about 50 meters..." Group Leader Carl Kubek lit another cigarette off the one he had just smoked down to a butt. He hadn't felt this warmth in his lungs for the three months he had spent in space and he was greedy for any kind of sensory stimulation now that he was finally free of the sterile isolation of the space capsule. Normally, the Exploratory Program didn't even consider men or women who were addicted to the primitive, self-destructive tobacco habit. But Kubek was an exceptional man, and so they made exceptions for him.

"You said 'craft'." Dave squirmed in his seat. "Do you expect us to believe..."

"I don't expect anything." Kubek snapped back in a puff of smoke. "You want to hear it now or you want to wait for a written report?"

"Go on, please." Otis Drew spoke to Carl, but he was looking at Dave.

"Okay, but pardon my syntax, won't you, fellas?" Carl wiped his hair back from his face, but the strands were heavy with sweat and they fell back down into his eyes.

"Anyway, the *craft* was disc shaped, formed from a silvery, metallic substance. There were no external marks of identification. The surface was smooth, except for four hatches along the perimeter at intervals of 90 degrees. I suited up and went out to inspect it. The hatch opened easily. I didn't even have to use a hydraulic..."

"I hope you realize that you violated procedure when you left the ship without permission. It was unscheduled, dangerous, and foolish." Dave didn't care for the way Kubek played fast and loose with the rules. Procedures had been codified for good reasons. Everything was so much safer, neater, easier to handle when the men kept to the pattern, did what they were told.

## ABOUT THE AUTHOR

Raymond Kaminski has been working as a scientific writer for fifteen years. Turning his hand to fiction, he has sold a novel to Tower Publications as well as this story to *Galaxy*. *Warriors* is scheduled to appear from Tower in January.





"Look, fella. At that distance from earth it takes over twenty-four hours between the time I transmit a message and the time I receive an answer. That's not counting the time it takes you guys to make up your minds. I'd still be driftin' out there somewhere if I had to ask for permission every time I wiped my nose."

"But you put the whole project in jeopardy. Whatever this thing was that you found, it obviously wasn't a natural formation. It was manufactured and when you forced the hatch, you might have killed whoever was inside—or been killed by them!"

"There was nobody inside."

"The craft appeared to have been designed for hauling cargo. There were no bulkheads, no internal fixtures. It was a great big container, probably was towed by a mother ship like a barge behind a tug. For some reason it had been abandoned. Maybe the mother ship developed technical problems and cut it loose. I have no way of knowing."

"You couldn't have known until it was too late. And we have only your word..."

"Look, are you calling me a liar?" Carl pushed himself to his feet. He was a big man, though his muscles were weakened from too much time spent in weightless space.

But Otis stepped in between them and overruled Dave.

"We selected Carl to head this expedition because of his initiative. We can't blame him when he uses it."

To be contradicted by his superior in front of Kubek was like a slap in the face. At least it felt that way to Dave. He had to switch his brain-wave generator to alpha, to calm himself enough to go on.

"After you breached the seal, what did you find?"

Carl looked at Otis before he answered.

"The craft appeared to have been designed for hauling cargo. There were no bulkheads, no internal fixtures. It was a great big container, probably was towed by a mother ship like a barge behind a tug. For some reason it had been abandoned. Maybe the mother ship developed technical problems and cut it loose. I have no way of knowing." He reached for another cigarette, but the pack was empty. He crushed it in his hand.

"Come on. Get to the point. What did you find inside?"

"Well, the craft was packed with crystals—clear, brittle crystals like diamonds or rock candy, and they had a bluish tinge. I thought you boys might be interested so I brought some back with me."

"Where are they now?"

Carl nodded in Drew's direction.

"In the lab. We're trying to identify the components."

"I want to see them."

"Of course, Dave." Otis Drew folded his hands in front of him. "Will you come along with us, Carl?"

"You couldn't keep me away." It sounded possessive. They were his discovery, after all. But when he tried to rise, he swooned and fell back into his chair.

"What's wrong?"

"Probably just the tobacco and gravity ganging up against me. Takes time before you get used to either of them again." Carl smiled, embarrassed. "You two go on ahead. I'll catch up in a minute or two."

As soon as he was alone, Carl sifted through the butts in the ashtray till he found the longest one. When he lit it, he had to be careful not to burn his fingers or his nose.

**D**AVE DIDN'T SEEM to want to talk when he came home. Lucy accepted his mood and braced herself for another night alone—for she would be alone as soon as Dave turned off the beta waves.

But after they picked their way through a silent dinner, the story began to leak out and exasperation over Kubek's impetuous conduct flowed into suspicions about the way Otis Drew had frustrated his authority.

"You mean that we actually have proof that there are other people in the universe?"

Dave couldn't help feeling betrayed by her enthusiasm.

"Second-hand proof. That's all. The only solid evidence is the crystals. The rest is hearsay, the word of a reckless rocket jockey."

"Well, what kind of crystals are they? I mean, are they sugar or salt or really diamonds?"

Dave shrugged sourly. Lucy wasn't the only one who would be excited by the news. Soon a lot of people would be asking questions, so he might as well start getting used to answering them now.

"We don't know anything yet. Samples are being shipped to the top analytical labs around the world. The crystals will be broken down into their components, bombarded with everything from lasers to proton beams. Then the results will have to be correlated. Till all the data is in, we're just whistling in the dark."

It was then that the beeping of the video-phone intruded into the conversation.

This time Otis Drew was as grey as the North Atlantic and the twitches on his face were white caps riding the crests of the waves.

"Kubek is dead."

"When? What happened?" Dave's finger automatically found the brain-wave generator on his belt and switched it off. There was more than enough adrenalin dumping into his system to keep him awake from here on in.

"We don't know. But the other members of the crew have fallen into comas. They must have picked up something in space. You better get over here. Quick!"

Dave stood there for a second, staring into the flickering storm left on the screen. Then he tore out of the door.

Lucy sighed long and hard. It was a good job, she told herself. Yet sometimes she wished all the commotion would go take a vacation.

Then she noticed the plastic bag on the counter. She opened it and found ant traps. Dave had remembered. With all the problems on his mind, he had remembered her ant traps. Poor Dave.

Lucy read the instructions, carefully pushed in the perforated holes around the rim of the cans and placed them at strategic sites around the kitchen. Foraging ants would enter the traps, carry the baited poison back to the nest, and soon the entire colony would be destroyed.

"Even in this age of rockets and space travel when astronauts are swarming all over the universe and bringing back unimaginable treasures, it's nice to know that some of the old-fashioned solutions still work the best."

Then Lucy gathered up the leftovers and stored them in the thermo-electric refrigerator.



coffee."

"It sounds simply wavelike."

"I wagged my head, meaning But Of Course, and gave him my bland smile, the one with just the lips. He'd think wavelike if caffeine ever got hold of his digestive system.

"But that," said the Dufai, "is as may be. There is a particular matter which must now be discussed, Wilson-man."

"Of course."

"I had hesitated to call your nest. It is my belief that a policy of general non-interference best serves the interest of efficient colonial administration. Even the fat-asses realized that after they had been here for a while." Otherwise, there wouldn't have been anything for the Dufai to grab away from them. "Leave the natives' customs and superstitions be, don't tamper with their nests and industries more than is absolutely necessary, and everything will run smoothly. That is the Dufai way. And it had always been successful. The Dufai Order, even before we assumed control of the Shubbi spheres of influence, has always been a model of efficiency. We have rarely had to punish anyone."

The chamber filled with the sinus-searing miasma of Dufai pride as Omlaf did what they do instead of beam and crack suspenders. I tried breathing very shallowly, through the fine crack between my still blandly smiling lips.

"But," Omlaf said, flicking his first major appendage, the one with the hollow barb and the poison sacs, "there is the matter of my private unit. My predecessor was unfortunately called away before he could explain to me the, ah, rituals, the protocol which your nest observes. I am baffled, Wilson-man, and it is starting to make me throbbing."

"Believe me," I said, not taking my eyes from that twitching first appendage, "I want you to know, we all appreciate the fact that you're having to put up with some minor inconvenience."

The first appendage uncoiled and rose and curled cobra-like in the air between us. The Dufai seemed to study the barb for a moment. "It has been some time since I contacted your nest with regard to this unit. Meanwhile, my administration is what you Terries call handsprung for simple lack of it."

"Our people are working on it, let me assure you of that."

"Your nest described the installation procedure as the merest thing. Yet I still have no easily accessible unit in my own chamber. The more I am told by your nest, the less I comprehend." He actually leaned toward me. It was all I could do to keep from jumping for the iris. The barb hovered above my head. "I am at twit's end, Wilson-man. Explain to me why I am having so much trouble with the Terrie communications system. Why could I not simply have kept my predecessor's unit?"

"That would have complicated matters unduly. For everyone. There are records to maintain. You can't ima—" I bit that off; you don't tell a Dufai that he can't anything. "We know what we're doing. My company, my nest, has been a going concern for a couple of hundred years, during which time procedures and policies that work have to be developed and refined and overhauled to the point that to tamper with them is to invite catastrophe. We readily admit that we make mistakes."

"Perhaps you would not make mistakes if your nest did not enjoy such a considerable degree of autonomy."

"But we explained the situation to you when you first came in to push out the Shubbi. And we explained it to them, too. And everyone agreed that our network should be integrated into the general system, first the Shubbi's, then yours. And at the same time. Just to keep things functioning smoothly. That the company should continue to have a free hand. No interference. It had been that way before the pulsing inception of the Dufai Order and the Shubbi takeover, and the company was enormously successful. It has been that way for the past century, apart from fat-ass excesses during the takeover itself.

With the result that you now have at your fingertips a network that—"

"I have no private access to any network of your nest's."

"But you will! You will! By no later than this very afternoon, or possibly tomorrow morning. And when you do get your unit, it will be yours, the one that you personally chose for yourself, not—I sneered and hoped that Omlaf knew it to be an expression of contempt—"a mere cast-off left by your predecessor."

Omlaf sighed. That stench you wouldn't believe. "It is to be hoped. Desperation forces me to confide in you, a Terrie. I must have my private unit today, Wilson-man. I lose status in my nest each time I use another chamber."

"Rest assured. We're doing all we can for you."

"You are pulsing," said the spiny bag of blubber, "for a Terrie."

"Where the Dufai sits, can a Terrie not be far away?"

That remark apparently made some sense to him, anyway. He finally sat back or settled down or in any case drew away from me, and the first appendage coiled itself in his quasi-lap, and I just barely repressed a shudder of relief. No degree of training can quite prepare you for the sight of a Dufai barb as it looks for nice soft spots in your pate.

"You will pardon my throbbing," Omlaf said. The Dufai do not really make requests, either.

"I appreciate the strain which you baleens—"

"I do not know that word."

"It's a word from a dead but still-honored Terran language. Great big ones."

"Bah leens. Very wavelike, Wilson-man. I shall encourage its use."

He waved the second appendage. I had been dismissed.

Desperately resisting the urge to laugh out loud, I gave him a respectful nod and backed toward the iris. As soon as I was through and the portal had closed, I went up the ramp at just under a trot, darting past surly but awkward Shubbi messenger boys and, as I neared the mouth of Red Tunnel East, all but impaling myself on a, fortunately, bottom-caste spiny whale—baleens, for God's sake, great big ones!—who took a swing at me with his de-barbed appendage. Then I was out of the Shubbi Arms. I quickly put as much distance between myself and the place as I could before I had to sit down and absolutely break up.

Bah leens! Very wavelike, Wilson-man! I howled. I rocked. I shall encourage its use! My God!

I had done it, I thought, cackling, crying, pounding my thighs with my fists, my very first real penetration mission, and I had pulled it off to perfection, and never mind that Omlaf was new to Earth and couldn't tell when his tentacle was being tugged. Never mind that spooky first appendage, either. Oh, he would get his unit, finally, for sure, but it would make him more throbbing than not having it, we would see to that as we saw to everything else. The Dufai had the run of the place for two, three decades, and the Shubbi for several more before them, and in all of that time they had, neither of them caught on.

Oh, and sure, I felt very patriotic and brave and all, a true descendant of the generation that had tried to match hardware with the Shubbi. But what really counted for me as I sat laughing and helplessly shaking my head was that I had gone right down into the midst of the bastards and shucked Ol' Massa Dufai, just as my parents and grandparents had shucked Ol' Massa Shubbi after all the hardware was gone and only The Big Joke On Them was left. I had upheld the traditions of both my family and the company. We Wilsons have been members of the resistance since the first gloating fat-ass came waddling and slurching down the gangplank. And as for the other, well, hell, nobody's ever licked the phone company.



# THE NIGHT MACHINE

by Dona Vaughn

THE GOVERNMENT PROVIDED a military hover large enough to hold Alec in his hos-suit to take him to his home and all of them, even the emergency crew on the hover, expected him to be dead when they opened the doors. To their surprise, he was not.

Dyane, standing at the doorway to supervise the hero's homecoming, felt a momentary chill as she remembered the indomitable, unconquerable will that was Alec Roche. But one look at his face and the hesitant movements of his chest reassured her. She had loved him so much that his leaving crushed the life out of her. Now she was a different woman—regrettably colder and perhaps more cruel—but blessedly different, and he no longer had the power to move her one way or the other.

She had set aside the largest bedroom for him, the one that had been his in the dim past when they were together, but his eyes remained closed and he was not aware of that small favor. The emergency crew slipped him out of the hos-suit and connected him to the robo-nurse before they left. Looking down at him, Dyane thought that it was the robo-nurse, not Alec which caused the faint, erratic rise and fall of his chest.

Only a small group of friends, hers, had followed them from Intercon IV. Ten or fifteen of them crowded into Alec's room with her and another fifteen or so roamed the house, changing places occasionally with the ones in the room. All of them felt it necessary to pat her on the shoulder and murmur, "Poor Dyane," when they passed, until finally her shoulder began to ache and she was sure she would scream at the very next person who came near her.

But the next person was Sandra who handed her a drink and from the very first sip Dyane knew that Mikkel had been up to his old tricks and spiced it with something truly lovely that gave her a wonderful feeling of oneness with the universe and an urgent desire to love and be loved in all the varied ways she and her friends had discovered over the years.

## ABOUT THE AUTHOR

Dona Vaughn's fiction has appeared in *Galileo* and *Galaxy*. She is a native of Texas and takes a lot of pride in her family—a husband and two children. Her free time is taken up with gardening and target shooting, which must keep down the rodents in the garden.

Then Sandra gasped and Val cried, "Look!" pointing at the robo-nurse. Dyane's beautiful feeling splintered and was gone. Alec's terrible eyes were open at last and he was looking around the room, gazing deeply, as only Alec could, into each of their faces. She followed his gaze around the room, looking into each of their faces as he did, and saw what he saw: their calm, matter-of-fact acceptance of his death.

He closed his eyes and someone murmured, "He's gone, poor thing."

Dyane could only sob, pointing to his chest, pointing at the thing no one else saw—the suddenly firm and regular rhythm of his breathing. She brushed them all aside and went to bed alone for the first night since he had left her a hundred years before.

Alec swam up out of a haze of pain and saw the faces dancing in the mist before him. As they became clearer, they became fewer. Finally he understood that as he improved, the watchers vanished.

It was agony for him to lie in the arms of the robo-nurse. When the telltales indicated he was getting stronger, the exerciser circuit was activated and his limbs underwent the further agony of mechanical movement.

Once he dreamed that the governor of Earth had come into his room and looked down at him lying there with the robo-nurse pumping his limbs up and down for him as though he were some sort of frantic machine himself. The governor had spoken to someone just out of sight. "There are some things that robos can't do and that was one of them. When he crawled into the hold of that ship, he saved the lives of seven thousand people." The governor sighed. "It was an honor to ship him back to the planet of his birth. A very great honor." He paused as if waiting for a response. None came. "Everyone thought he would die. You understand that. They would not have done it if they could have guessed what kind of man he is. If they had known... You understand..." The governor's voice trailed off into silence. Then, in a completely different tone, "Who will tell him?"

"I will." Dyane's voice floated out of some unseen corner of the room, and in it there was a minute trace of something that could only be detected by someone who had been as close to her as Alec had been a hundred years before. Triumph. Just a trace. Then it was gone. "I will be the one."

After that he was not sure what was consciousness and what was not. The frantic pumping of his arms and legs seemed to go on eternally, even in his sleep, permeating every dream but one, that of the night machine.

He had not dreamed of the night machine since he was a child, but now he dreamed of it constantly. The night machine had been, in reality, the vast machinery in the basement of the self-contained apartment house in which he had spent his childhood, the machinery that purified the apartment dwellers' waste and returned it to them in usable forms. But he had not known that when he first saw it as a four year old. The vast clanging machinery haunted his dreams for weeks. He had seen it as a masticator of men and he knew then as he knew now that when he died he would go into the night machine to reappear later in another form—purified, improved perhaps—but changed; and it was the change, the loss of the uniqueness that was himself, that he feared more than the physical fact of death.

He woke one morning to a clear, cold consciousness of self that left no question as to what was dream and what was real, and while he might have teethmarks on his soul, the night machine would have to wait a little longer.

There was a soft sound, a whisper of movement beside him. He turned his head and saw Dyane. He felt his lips shaping into a smile. "Dyane..."

She shook her head to ward off whatever he might say next. "Leo has been calling to check on you. He would like to see you

as soon as you feel like it."

"Tell him, this afternoon," Alec said. "You can unhook me from this thing now."

Another woman might have protested. Another woman would not have known Alec so well. If he had said he could survive without the robo-nurse's ministrations, then he could. She unhooked him without comment and stepped back, not offering him a hand, as he sat up for the first time since he had come home to Earth.

She stood quietly, waiting, and after a long moment, he stood up. With the slow, shuffling steps of a very old man, he walked to the window. He braced himself against the wall and examined the stranger's reflection in the glass before him. "I'm better than I was."

"Yes."

He could sense that she was waiting, catlike, to pounce on something. "This time when I leave—"

"I thought you were gone for good. We agreed on that. My life is arranged. And now you've come back—" She took a deep breath. "I don't fit into our old patterns anymore," she went on quietly, trembling with anger contained. "I've changed. I've changed, but you haven't."

"It's only for a little while," he said patiently, not understanding, not yet. "Only until I get my strength back. Then I'll be gone and you'll have your life back, just the way it was." Her expression did not change. "After I'm gone—"

"You're not going. You will never be strong enough to leave Earth. They would not have brought you back if they had realized you were going to live. They didn't know you, Alec. Not like I do."

"When I get stronger," he said, hearing her words, but not assimilating them, not yet. "I'll leave and then you'll—"

"No."

"I don't—"

"You're a prisoner of gravity. You'll live, but your body will never again be strong enough to survive the lift off from Earth."

He continued to look at her, still not comprehending, until he saw the tears shining in her cheeks and then, finally, he understood. No matter how long and how hard he fought, the way to the stars was closed to him. Forever.

Leo Brandon came at four.

He had been the only person on Earth gratified to hear that Alec Roche's flame was not extinguished. Since that was a manifestly unpopular view, he had kept it to himself and.



He limped over to the table to examine the choice she had left him. The reflection of his own hand reached out to him as he picked up the knife. He switched it on and ran the edge of the beam carefully along his thumb. A long thin sliver of flesh curled away and floated down to the tabletop. It would be over so quickly and then there would be no more pain. He could no longer remember what life had been like without pain.

fingers crossed, he had dreamed. Now he would see whether those dreams could stand the light of day.

He let himself in.

The sounds of music and laughter drifted down from the rooftop gardens, but the house itself was empty and echoing. He found Dyane just leaving Alec's room. When she saw him, she closed the door gently behind her and leaned against it, looking pale, fragile, and unutterably weary.

"He knows?" Leo asked.

"He knows."

"And he accepts it?"

"When has he ever accepted anything?" she said bitterly and walked away.

For a moment Leo allowed his emotions free rein. Then, with an effort, he smoothed away the grin and composed his face into the proper lines for visiting one's best friend on his deathbed and went inside.

When he saw the crippled old man standing beside the window, he thought he was in the wrong room. Then the man turned and he realized it was Alec.

"I should have died out there," Alec said, by way of greeting. He limped back to the robo-nurse and sat down.

"Everyone expected you to. They would not have brought you back otherwise. You have to understand, Alec. They were not being cruel. They simply did not understand you."

"And what do I do now?"

"You make a life for yourself, I suppose. As best you can."

"I've been thinking...a clone, perhaps, and a memory transfer..."

"You haven't really kept up with the news from home, have you Alec?" Leo said gently.

"What news?"

"Why, the news that we are in perfect balance here on Earth. The population is completely under control. Of course, it has required a lot of hardship. A lot of personal sacrifice. There is always a hardcore majority that will not leave a planet, no matter how crowded it gets. And of course with our lengthened life span—we simply had to adopt certain restrictions...You do understand?"

"Cloning?"

"Is illegal. I am sorry, Alec. If they could change the law for anyone, they would do it for you. The governor himself told me so."

"But there are other places off Earth where—"

"They could fix you up in no time...If you could get there. But you can't get there, Alec."

Alec lay back and let the robo-nurse's arms snake around

him. He closed his eyes.

"I'll be back," Leo said.

Alec said nothing.

He woke to the sounds of music and laughter and he realized he had been hearing the same sounds in the background day and night since consciousness returned, the noise of Dyane's perpetual party. He stirred and the robo-nurse subsided.

Someone had thoughtfully left a cane and a robo-chair by the door. He chose the cane and limped down the hall toward the music and laughter.

Forty people filled the circular mainroom and in the center of the room on a mirrored tabletop, Dyane lay naked. Leaning over her was a tall, thin man who with skillful hands was embroidering fantastic sketches on her skin with a laserneedle.

She of all the crowd saw Alec in the doorway. "Come and watch," she cried. "I'm having my life story written on my skin."

Alec limped closer. The tall thin man was sketching a woman's face on the soft mound of Dyane's left breast. "My mother," she said. "I'm saving my labia for my father." The woman's face blossomed in brilliant line under the artist's hands. "I'm tired of the past and I find this old skin is too tight. I'm going to get a new one soon and I wanted to get the maximum use out of this one before I shed it." She laughed until the artist hissed at her to be still.

Alec saw then that there was no place in her life for him. One more doorway closed before him. The options were narrowing. He watched the needle skipping across her flesh for a few moments and then limped back to the robo-nurse to think it over.

When he finally slept the night machine crunched and rumbled so hungrily through his dreams that he woke again in a cold sweat, bringing the robo-nurse back to life.

He lay quiet, passively accepting its ministrations until sometime in the early morning hours when the party swirled out of the house and swept on to livelier places. He shook off the robo-nurse and, leaning heavily on the cane, limped down the hall to the mainroom. On the mirrored table where Dyane had lain, there was a knife. He knew Dyane had left it for him. She had known where his thoughts would take him—hoped perhaps that he would choose that route. The means lay within his grasp. She had gone no further than that.

He limped over to the table to examine the choice she had left him. The reflection of his own hand reached out to him as he picked up the knife. He switched it on and ran the edge of the beam carefully along his thumb. A long thin sliver of flesh curled away and floated down to the tabletop. It would be over so quickly and then there would be no more pain. He could no longer remember what life had been like without pain, the pain of his poor battered body and now the other, inner, pain, that tortured him when he thought of the stars, forever beyond his reach. But just as he had been unable to give into death in one form, he was unable to give into it in another. He would fight against the night machine even if it meant two hundred more years of pain and struggle before he succumbed.

With infinite care, he replaced the knife on the mirrored tabletop and turned away. From behind him somewhere, he heard a long, low sigh and he turned in time to see a flash of iridescent tattooed skin disappearing into the garden room. He waited a few moments and when she did not reappear, he went back to the robo-nurse's arms.

IN THE MORNING LEO BRANDON came again, whistling in a particularly lighthearted way Alec found so irritating that it alone would have drawn him back from the grave. "It's time you were up and



about," Leo told him. "You've got to come and see my babies."

"Babies?"

"That's what I call them. You haven't even asked me what I'm working on."

Anything, Alec thought, to keep him from whistling. "All right, what are you working on?"

"A zoo," said Leo and chuckled like a madman.

Leo's zoo consisted of rows and rows of ampules in a liquid nitrogen freezer. "They're part of the package for the Andromeda Probe, the cells of all Earth's creatures—except man," Leo grinned. "But he will be represented too. I have permission, unofficial of course, to pick up human cells off planet for two cloned volunteers when I collect the rest of the package."

Alec leaned heavily on his cane, staring at the freezer. "I'm afraid I don't quite understand."

"You haven't heard about the Andromeda Probe? It's been planned for the past ten years!"

Alec thought of muscles and bones strained beyond endurance and the terrifying knowledge that seven thousand lives depended on him. "It must have slipped my mind," he said mildly.

"Yes, well, it's a purely scientific venture to explore the M31 galaxy—"

"Two million light years away... Are you sure we'll still be here when the results come in?"

"I have to assume someone will." For once, Leo was quite serious. "I believe in Man. I always have." He reddened slightly and hurried on. "The probe's computer will carry out mechanical scans first, and on the basis of that, decide at what point to start the cloning and educating of the volunteers." His eyes sparkled. "Can you imagine it? Two humans with a life span of five hundred years and the best equipment our civilization can furnish and a whole new galaxy will be theirs to explore. If they find no life they can seed selected planets for us."

"Us?"

"We'll be there eventually. Man always pushes outward. It's his nature."

"Why only two humans? Why not enough to establish a colony?"

"We wouldn't want to meet ourselves when we get there, especially not with that much lead time. Look how much trouble we've had rooting out entrenched colonies in our own Galaxy. Let's hope Andromeda holds something a little less dangerous than humans." He chuckled like a maniac. "But what do we care about that? You and I will be long gone by then."

When Alec returned home, the house was still empty. No doubt the party was continuing elsewhere with Dyane at its center, but Alec was left alone with his thoughts. When he slept, the night machine was back in his dreams, but this time instead of something that longed to devour him, it was a fantastic steed that he rode across great distances into another universe.

In the morning he called Leo. "Feeling better, are we?" Leo said. "How about lunch?"

Leo picked him up, took him to a remote beach, and floated him out on an air skid half a mile from shore, before he turned on a damping device and said, "Nice day we're having, isn't it."

"You know what I want, Leo."

"I know."

"Can you do it?"

"Certainly!"

"How soon?"

"As close to departure time as possible. Once I'm off Earth we can't be stopped. I leave May 31st. You come to my zoo on the 30th and I'll give you another tour."

Before they floated back to shore, Leo said, "After that, this body won't matter, you know."

Alec understood. Leo was telling him it was all right to give up once he had donated the cells and the tapes. "I'll bring you something afterwards," Leo said and Alec was grateful to him.

There was the problem of the law. They had the tacit approval of the governor, but at the slightest hint of publicity that would vanish. The punishment for illegal cloning was death. After Leo and his zoo were safely off Earth, it wouldn't matter, but until then Alec had to be very careful.

Dyane came back to the house minus the party and took to watching him like a curious cat. She wore no clothes in the house and he grew used to the iridescent flash of skin that announced her presence.

He was glad when he awoke on the morning of the 29th and found that another party was underway. That would take Dyane's mind off him. He dozed in the sun and gathered his strength. Sometimes the party swirled into the garden around him and he didn't even notice as he dreamed of galaxies beyond reach.

He went to bed early that night. The robo-nurse, no longer activated, surrounded him like a silent metal guardian, and he slept peacefully for once with no dreams to disturb him. He woke to find that the night machine had come to life in the beautiful gold light of dawn and was holding him fast in its steel embrace.

Dyane stood by the door, watching him.

"Let me out of this," he said calmly.

"I know what you're planning to do. You haven't considered the consequences to me, have you? You'll be dead and I'll be under suspicion... They'll restrict my movements and my friends will desert me and you don't even care. You don't think of me. You didn't think of me when you left before. You..."

She turned to hide her face. He stopped trying the strength of the robo-nurse's arms and considered her back. "You could have come with me."

"I couldn't," she cried and ran out of the room, leaving him a captive.

He began again, methodically, to try his strength, and he wondered for the first time why she had not accompanied him a century before.

The robo-nurse had not been programmed for violent patients. He beat and battered at it with his body until its parts buckled and unlatched and then he lay in its ruins trying to gather strength that was no longer there. Finally he gave up and simply rolled out of the robo-nurse's remains and onto the floor. He lay where he had fallen until he knew if he lay there a second longer, he would never move again.

He began slowly, painfully, to inch his body toward the door. Time was passing, a lot of it, and it seemed to his weary eyes that he was no closer to the door. Somewhere in the distance he heard the soft ping of the triphone and he knew that Leo was trying to reach him, wondering if he had changed his mind at the last moment, and knowing he would not.

And then he forgot Leo, forgot that other promised future self, forgot everything except that he had to crawl through the doorway ahead; forgot everything except the pain, pain, pain, pain, pain of muscles stretched beyond endurance and still functioning. Nothing, not even the iridescent flash of skin, registered until he felt the salty drops running down his face and knew that he was laying on his back. He knew then that he had made the ultimate effort, had called every ounce of strength out of his body, ravaged it for everything it held, and everything was not enough. He was laying on his back and the doorway was forever beyond his reach, like the stars themselves.

Then he realized that the salty tears running down his cheeks were not his own but Dyane's and that she was cradling his head in her lap. "All right, all right, you utter and complete

[Continued on page 39]

# IN THE DAYS OF THE STEAM WARS

by Eugene Potter  
and Larry Blamire

*What is considered by many to be the most decisive development in the history of steam warfare took place in 1895 when military engineers in the Republic of Normandy discovered the traction-bearing drive. Until that time, the size of the steam rig itself was limited by the precision with which its drive gears could be machined. Small imperfections in gear teeth create noisy vibrations when teeth mesh at high power and speeds. The result can be debilitating noise for the crew as well as an unstable drive system liable to breakdowns. Until the discovery of traction-bearings, experiments with rigs larger than ninety-five feet led to damaged gears and broken crews.*

*While traction-bearings solved the mechanical problems inherent in the construction of truly large steam rigs, the fuel problem remained. A larger rig requires numerous coaling stations, effectively obviating the possibility of overland invasion into enemy territory. It was a remarkable confluence of circumstances, then, when the Norman steam works produced the first oil-fired steam engine in the same year the new drive system was developed. In one stroke, the Norman steam forces acquired a rig much larger than any seen before which was also capable of extended forays overland.*

—Samuel Ellicot Morrison  
from *A Concise History of Steam Warfare*  
on the North American Continent.

## ABOUT THE AUTHORS

Artist **Larry Blamire** is well known to readers of *Galileo*. He acts with the Boston Shakespeare Company when he is not painting and he is keenly interested in filmmaking. He was the original creator of the *Steam Wars*. **Eugene Potter** has had short stories published in *Galileo*. He claims to have gotten involved with Larry's *Steam Wars* project because he always wanted to combine his interests in science fiction and history.





At the compound the carnage was awful. Confusion reigned among the demoralized Americans. Bodies lay everywhere and the scene was a mess of flying limbs, scalding blasts of escaping steam, and sheer terror. Here and there a crewman sought refuge among the buildings, only to be crushed as the structures collapsed, one by one.

**L**OWELL IS SITUATED AT the junction of two major rail lines and occupies a bend in the Merrimack River. It is the site of the regional service facility for the United States Steam Forces, Fort Salmon P. Chase. To the north there are low hills, then the border of Nouvelle-Normandie just two miles away. To the south there are even lower hills, then metropolitan Boston, resting in the center of a geological basin.

On October 12, 1897, the peace of the normally placid countryside was shattered by the appearance of the largest steamrig ever known on the North American continent. The 150-foot man-shaped machine appeared in the hills to the north, indiscriminately smashing barns, houses, stone fences, and trees as it trundled through the small farms which cover the landscape in that part of New England.

The locals knew the great machine was making for the Chase steam works. Even if the fort had been heavily guarded (and it was not), it is hard to believe the U.S. steam forces would have had anything to stand up to this Norman juggernaut.

Nobody expected an attack from the northern countryside. American steam forces were guarding the coastal highway at Ipswich, fifteen miles east. The Americans were unprepared for either an overland attack or an assault by a steamrig 150 feet high.

An occasional farmer would bring out a loaded rifle and fire at the advancing behemoth, but it was hopeless. A lucky shot through the "eye" might have wounded one of the two pilots or perhaps even the captain. But, faced with such an enormous destructive machine, not even the doughty New England farmer had the nerve to stand fast and aim his rifle properly.

The Norman machine slowed, however, within a mile of the Chase steam works while its captain surveyed the compound.

He stroked his short elegant beard thoughtfully and half-turned to the young officer who stood at wide stance attention behind him.

"*A moi ces jumelles,*" he said. "Toss me those field glasses."

The young man nodded and handed him the field glasses, then took the mouthpiece of the speaking tube from its hook on the ornate cabin wall.

"*Toute halte,*" said the captain. "Full stop."

"*Toute halte,*" repeated the lieutenant into the speaking tube.

The enormous rig took another ponderous "step" and halted, its great six cylinder reciprocating engine chuffing at idle belowdecks.

The landscape before the four men in the lofty cabin stopped rocking and the captain scanned the five brick buildings of the Chase compound with his field glasses. The facility consisted of a depot, a small fabrication plant (nothing like the one in Montreal), two hangars, and administrative offices, all low brick buildings with few windows and substantial-looking architecture in a military style.

Three American rigs stood in and about the compound, small protection for an important military installation. The largest of them was fifty feet tall. The other two, lightly-armed one-man walkers, were only twenty feet high with armament limited to single Maxim machine guns. Another rig (which would have been fifty feet high, had it been standing) was under repairs

and rested in great, helpless pieces before one of the hangars.

There were signs of activity in the compound, evidence that the Americans bestirred themselves from the shock of their first look at *R.N.V. Colosse de Fer*. Smoke began to billow from the shoulder stacks of the largest American rig. It made tentative movements, as if in drill and slowly—in a complicated series of maneuvers—turned to face the Norman machine.

"*Nous sommes à portée de ce vapeur là,*" said the captain. "We are within range of that rig." He turned again to the lieutenant. "*Commencez!*" he said. "Fire away!"

"*Commencez!*" repeated the young man into the speaking tube.

The titan's ten inch chest gun coughed a single tracer over the mile separating the enormous rig from its target. The tracer landed short, taking a corner from the steam hangar in the foreground and raining bricks over the dismantled rig on the pavement. There was a pause while the Norman gunner made adjustments, then the cannon opened up again. Two exploding charges went wide of the American rig, reducing half the depot to rubble. The third shot—after another pause—found its mark and halved the American rig at its "waist." Orange smoke surged skyward as its magazine detonated.

"*A discrétion,*" said the captain. "At will."

The lieutenant repeated the orders behind him and the captain studied the scene ahead. At the compound the carnage was awful. Confusion reigned among the demoralized Americans. Bodies lay everywhere and the scene was a mess of flying limbs, scalding blasts of escaping steam, and sheer terror. Here and there a crewman sought refuge among the buildings, only to be crushed as the structures collapsed, one by one. A marine platoon leader, looking splendid in his blue jacket, attempted to get his detachment in formation, but his shouts could not be heard over the roar of the shells and exploding charges. He was killed in the first three minutes by shrapnel.

In the relaxed and comfortable control cabin of the Norman monster, the captain studied the firing pattern of his barely competent gun crew. "*Expédiez le vite!*" he snapped. "Finish it off quickly!" He watched the shells from his rig's other guns strike the low buildings, knocking chunks of brick from them. The exploding shells of the big chest gun, however, accomplished most of the destruction.

The big cannon in the rig's central cabin was capable of firing twenty rounds in a minute. Even so, it took the inexperienced Norman gun crew a half hour to completely flatten the steam works. The drift on a projectile from a ten inch shell is only two and a half yards over the course of a mile, and deviation is less than two yards in a ten-mile wind. But the Norman guns continuously struck wide or short.

Nevertheless the explosive power of the Norman's guns made up for the incompetence of the gun crew. A near miss inevitably destroyed the rig's target anyway. The first mission of *République de Normandie Vapeur Colosse de Fer* was shaping up as a success.

Never having fired a shot in return, the Chase steam yard was completely destroyed. The two walkers were dismembered and buried in the wreckage. The large rig under repair was less than scrap metal, and black smoke enveloped everything.

"*En avant,*" said the Norman captain. "Forward."

"En avant," echoed the lieutenant into the speaking tube. The Norman's guns stopped. The great machine's engine rumbled as it built steam to move the great "legs."

"Quatre degrés à droite," said the captain. "Four degrees to the right." He waited to hear the lieutenant repeat the order into the speaking tube. "Vers Boston," he said.

Corporal Frederick Winchendon was aware that an order to find errant Gunner Sergeant Tom Service amounted to an order to prowl all the bars in Gloucester. He silently cursed his superiors for forcing him to abandon his work on the U.S.S. *Javelin*'s right arm and took up the job of searching for a man he knew was not worth finding. He would have preferred to finish tearing down the "shoulder" set to examine that bearing. He was convinced he could repair the bearing himself, if only the captain would give him a chance to examine it. Instead, he found himself walking from bar to bar and tavern to tavern. He finally discovered the "gunny" alone at a table in a dingy place on the Gloucester waterfront.

You can't just drag a man out of a bar on a Saturday evening. Even a drunken lout like Service deserved the courtesy of being allowed to finish his drink, so Winchendon sat quietly while the sergeant took great gulps from a tumbler of whiskey and tried to explain steam strategy to the serious-minded corporal. If there were any chance of actually learning strategy from the bleary-eyed gunny, Winchendon would have hung on the man's every word. But he dismissed the whole one-sided discussion as so much drunken rambling. He gazed wistfully toward the door of the bar, hoping Service might somehow remain in a condition equal to walking back to the Gloucester train station after he finished his interminable last drink.

His gaze was interrupted, however, by the appearance of three men approaching their table. They wore the dark blue wool frocks of the U.S. Revenue Cutter Service and they carried themselves like Gloucester locals. They swaggered a little.

"Well, well, well," said one of the sailors menacingly, while he dropped his glowing cigarette and ground it out on the barroom floor. He was looking at one of his companions, a bearded brute of a man, when he said, "Do we have the honor of entertaining the steam forces tonight?"

Service broke off his monologue on the strategic insignificance of the coastal highway. The two steam crewmen stood up from their small table.

"At your service, sir," slurred the sergeant good-naturedly and adjusted his neck kerchief. "Gunnery Sergeant Tom Service, the chest gun of the U.S.S. *Javelin*."

Winchendon didn't say anything. He didn't want trouble from the Revenue sailors, but he didn't want to be friendly with them, either.

"And what part of the steam man do you run?" said the third sailor to Winchendon.

"Excuse me," said Service, smiling. "We don't call it a steamrig."

The third sailor looked at Service. "And what part of the steam man do you run?" he repeated.

"You can tell by looking at him," interrupted the bearded monster—and at this, Service took a surprisingly steady step toward the sailors—"He's the prick." The sailors all began to laugh. And they laughed so hard that they weren't prepared for the apparently drunk Service to pick up a nearby chair and club the bearded man with it.

Winchendon knew instantly that he had no recourse but to fight. Falling easily into the hand-to-hand movements that he had learned so recently in basic training, he belted one of the sailors with a double-handed blow to the temple and kicked the only one who had remained standing. At that point, however, the one Service had clubbed staggered to his feet and prepared to face off with the corporal, who raised his fists.

Then two things happened. The number of Revenue sailors increased by six or eight (Winchendon didn't have the presence of mind to count them) and Tom Service disappeared.

Winchendon punched and kicked valiantly for a few seconds, but there were so many of the sailors that he could not prevent himself from being pinioned. He tried vainly to get his foot behind the leg of his captor and he had a few anguished instants of realization as he saw a line beginning to form in front of him.

The sailor at the front of the line bowed comically to Winchendon.

"Prick," he said, "I would like you to meet the man who has the first whack at punching your guts out." He turned and made a gesture to the large blond-bearded creature beside him. "This here," he said, "is the Chief Stoker of the Revenue Cutter *Quincy*." He turned back toward Winchendon. "Chief," he said, "This here's the prick of one of the steam men from Ipswich."

Then the burly stoker stepped toward Winchendon and began to punch him alternately in the head and stomach.

The young corporal remained conscious long enough to hear one of the sailors say, "Come on, now, Chief, give the rest of us a chance."

IT IS ELEVEN BLOCKS FROM the Gloucester Police Station to the city limits. Winchendon would have preferred to walk—or limp—the distance in silence.

But Gunnery Sergeant Service, having secured the corporal's release from jail, seemed inclined to conversation.

He looked at Winchendon as the young armsman struggled to keep up with him on the uneven brick pavement.

"You look a sight," said the sergeant. "Maybe you'll look bad enough for the captain to take pity on you. He's not too happy about diverting to Gloucester."

Winchendon was preoccupied with his pains, but he managed to summon enough concentration to look back at the sergeant while he limped along.

"Where did you go?" he asked.

"The captain," said Service sympathetically, "said he would contact the Paymaster about making deductions from your pay as soon as we get to Lowell."

"Deductions?" croaked Winchendon.

"Captain put up the damages to get the innkeeper to drop the charges. He intends to get the money back."

"Didn't you tell him it wasn't my fault?"

"Corporal," said Service. "It doesn't matter whose fault it was. When you bust up a bar, you pay for the privilege. I know. I busted up plenty of them in my time."

"Sergeant," said Winchendon. "You started that fight. I didn't have anything to do with it."

"They sure were beating you up like you had something to do with it," said Service.

Just then they caught sight of the *Javelin*'s torso, towering above the houses along Washington Street. It looked like some mythological giant guarding the town. Wisps issued from its shoulder stacks and the two of them could just make out some of the crewman idling behind railings just below the machine's "head." Winchendon saw his friend Stevens at the very top of the rig's "helmet." He could not see what he was doing, but assumed he was polishing the six-pounder which he operated so effectively at the target range in Ipswich. The ninety-five foot rig was altogether a picture of calm inactivity.

"Why are we shipping to Lowell?" said Winchendon.

"Maintenance," said Service. "Captain decided to report a week early because of the bearing in the right arm." He fished sympathetically. "I hope he doesn't blame that on you, too, Corporal."

Winchendon groaned. "Is the coastal highway secure?" he said.

"Is the highway secure?" said the gunnery sergeant, grinning. "Are we taking up that strategy now, Corporal? We aren't any good at beating up Revenue sailors, is that it?"

"Don't push me, Sergeant," said Winchendon.

"Settle down, boy," said Service. "You're in no shape to back up any threats. I'll answer your question, though. I don't



think the coastal highway is secure. They still have the *Talos* and the *Washington*, but I think there could be an attack any time. That's what I was explaining to you last night when we were interrupted."

"The Normans wouldn't attack during peace negotiations."

"Peace negotiations don't mean anything to the Frogs," said Service. "They just want to get us by surprise. They want to attack with their new steamrig."

"New steamrig?"

"The Frogs," said Service, "have a new steamrig which is half again as big as a conventional rig. It has more armor and firepower than three *Javelins*." The sergeant gestured toward the steamrig ahead of them and Winchendon thought he saw an increase in activity on the machine, as well as he could tell through the telegraph lines in the foreground.

"You're talking through your hat, Sergeant," said Winchendon. "They would never make a surprise attack. It goes against the code of steam warfare. And besides, I've studied a lot about steamrigs and I can tell you that nobody can build a drive train for a machine like you're talking about."

Service shook his head. "Come on, Winch," he said. "You sound like those old farts at Command."

"Don't call me 'Winch'," said Winchendon. "Nobody can build the gears for a rig like that. A rig like the *Javelin* is as big as they can get. Any bigger and the minor imperfections in the gears set up vibrations that will shake the rig to pieces the minute it starts up. It's impossible to machine the gears fine enough. Not to mention you couldn't carry enough coal to fire such a big machine. There are enough problems with stoking the *Javelin*." He remembered with a twinge the weeks he spent in the stoke hold of the great rig.

"Maybe they have a new kind of fuel," said Service. "And maybe they don't use gears."

"Don't make me laugh," said Winchendon, rubbing his jaw. "It hurts. And I suppose you're going to tell me we don't have to guard the coastal highway because this giant rig will come overland from Montreal where the Frogs have their steam works. I suppose this big machine doesn't need regular steam highways."

Winchendon noticed a definite increase in activity on the distant rig. Crewmen rang along catwalks, shot up ladders, and rapped down the torso on grapnels. Their red and white striped jerseys merely looked pink at this distance.

"What's going on?" said Winchendon.

Before Service could venture an answer, the machine's whistle sounded, shortly but piercingly. It screamed into the sky over Gloucester three times and Winchendon had to cup his hands over his ears against the excruciating sound.

Service pushed the corporal. "Combat alert, Winch!" he shouted into the young man's ear. "Double-time!"

The two of them broke into a run, heedless of hangovers, bumpy brick pavement, small children, and a crystal blue sky.

Winchendon swung himself into the basket from which he operated the *Javelin*'s right arm. He pulled the clutch lever to engage the mechanical system which operated the traction telltales and enabled him to coordinate his operations with those of the left arm.

"Forty-five degree swing," barked the speaking tube next to his right ear.

"Forty-five degrees," shouted Winchendon, setting the pointer at forty-five and cranking the knobbed wheel which would engage the limiting studs. He checked his instrument board at the mechanical pointer for the left arm. As soon as the pointer crossed into the red area marked "Forward Swing," he pushed his throttle back toward swing. It took three swings to get the arms into perfect coordination. Winchendon had a counterpart at the left arm, a man named Fitzsimmons who occupied a basket thirty feet away, on the other side of Service's six inch gun. Once the two armsmen achieved perfect synchronization, their arm swinging could increase the rig's



walking" speed by as much as three miles per hour. A steamrig is a powerful machine, but it had not improved on any of the dynamics of human walking. Any steam crewman can talk at length on the importance of a good arm swing to steamrig locomotion.

An arm sman, however, performs his job with practiced motions and is able to remove some of his concentration from the operation once the rig is fully underway. It is much the same as a bicycle racer, who is able to take his mind from the complicated work of pedaling and balancing in order to consider strategy. It was inevitable, then, that Winchendon's

mind would begin to drift and to reconsider the events of what had been (so far) the most unpleasant day of his life. Not since he had fled his parents' poverty-stricken farm near Smyrna, Delaware had he suffered such humiliation. Captain Feller had made him and Service stand within the railing of the *Javelin's* broad "epaulet."

They stood in the wide-footed stance which passes for "attention" on board a swaying steam rig. They waited for Captain Feller to finish shouting into his speaking tube. The rig was thunderous when it was underway, but the captain was a big man and took resonance from the full height of his body

when he spoke.

"Stay on the steam road," shouted the captain into the tube. "We'll use 128 at least until we hit Peabody. Stand by for more orders when we get there."

He replaced the cap on the speaking tube and looked up at the two crewmen.

"Corporal," bellowed the captain, "you're lucky: the Steam Corps outlawed flogging." The captain, an old-timer, often forgot himself and referred to the service by its obsolete designation as a Corps.

Winchendon gulped. He wanted to say something in his own defense, something to relieve the humiliation of being posted on the epaulet. But he couldn't think properly with the wind whistling in his ears at twenty miles per hour. And he hadn't the wherewithal for all the shouting anyway.

"Do you like operating the right arm?" shouted the captain.

"Yes, sir," shouted Winchendon.

"You don't want to stoke again?"

Winchendon thought about the grimy, sweaty cabin in which the stokers strained their backs firing the furnace for *Javelin's* four cylinder reciprocating engine. "No, sir," he shouted.

"I'm sure Chief Duff would be happy to get you back down there in the engine room," the captain bellowed.

Winchendon didn't know what to say.

"You're going to have to get back to your arm," boomed the captain. "We can't make top speed without the swinging. You're just lucky we don't have another trained armsman."

"Yes, sir," shouted Winchendon.

He hoped the interview was over, but Service spoke up.

"Sir," said the gunny, with the practiced projection of a crewman, "are we going to fight?"

"You're damned right we are, Sergeant," said the captain. "The goddam Frogs are here."

Service glanced quickly at Winchendon and smiled. Winchendon just wanted to get off the epaulet and back to his station, but Service seemed determined to prove his contentions in front of the corporal.

"What about the peace talks?" he said.

"The peace talks have gone to Hell," replied the captain, turning to bring a chart down from the rack beside him. "Normandy wasn't ever interested in peace. Damned Frogs just wanted to take us by surprise. Their rig didn't even come by the coast road, for God's sake. It came overland from Montreal. If the reports are correct, it has destroyed the steam works at Lowell."

"You had better get to your posts, both of you. The report says this rig is 150 feet tall. We've got the fight of our lives coming up."

**T**IME PASSES QUICKLY IN a steamrig. The large and powerful machine requires constant attention to keep it running smoothly and on course. Course corrections are frequent, speed and power are constantly adjusted for gradients, and when a rig is on combat status the gun drills are incessant.

Winchendon did not notice how quickly time was flying as he responded to orders from the speaker next to his ear, accelerating and decelerating the swing of the right arm, throwing his clutch in and out. He was lost in the rhythm of the rig's swaying gait. He had no idea that the captain had commanded the unprecedented operation of entering the metropolitan area at Peabody, that they were striding southwestward through the towns of Boston's north shore, scattering pedestrians, carriages, and bicycles. He had no porthole at his station and he wasn't privy to the captain's decisions. He knew enough about tactics, however, to realize that their only chance was to engage the Norman north of the Charles River. They might hope to hold the invader there until the *Talos* and the *Washington* got word and followed.

Winchendon swung slightly in his gimbaled basket, working



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his throttles and clutch automatically, when a strange hum brought him back to where he was. His experienced ears picked up the unusual sound from among the crashing din which echoed about the work cabin.

"What's the matter, there, Winch?" shouted Service from across the cabin.

"I don't know yet, Sergeant," shouted Winchendon, too concerned with his board to notice Service's use of the hated nickname.

Service went back to berating his gun crew, putting them through their loading and servicing drills.

The hum continued and Winchendon saw his steam pressure gauge advancing. He hadn't heard any orders to pick up speed and he began to worry. He waited another second, then tried to throttle down during the forward swing, just to see if he could reduce the pressure. Fitzsimmons would notice it immediately and would compensate. The hum continued. Throttling down did nothing to push the needle back.

"Sergeant," he shouted to Service. "Trouble here."

"What is it, Winch?" shouted the Gunnery Sergeant. "Oh, God, boys. There it is. Have you ever seen anything like it?"

Winchendon risked a glance at Service and his gun crew. The sergeant was jumping back and forth between the big gun's sights and the side of the port, where he could see out.

"I got trouble with that bearing, Sergeant," bawled Winchendon, the hum increasing alarmingly.

"Not now, Winch," shouted Service. "We've sighted the Frog."

Winchendon heard a fearful groan and he knew the bearing was seizing up.

Service looked up from talking with one of his gunners.

"Winch," he shouted, "throttle back that arm!"

"That's what I'm doing, Sergeant," shouted Winchendon, getting scared.

"Then get her into the forward position if you can," shouted Service. "It sure won't do us much good down. Ninety degrees."

Winchendon reset his pointer at ninety degrees and wound the knobbed wheel to adjust the steamrig's enormous set screws.

"Fitzsimmons," bawled Service to the other side of the cabin, "stop your swing. We'll be off balance."

Winchendon threw his forward throttle up in an effort to drive the arm upward. There was another groaning and a vibration which gripped his basket.

"Goddam it, Winch," shouted Service. "Power down on the other throttle. Do it now. I don't want to have to come over there."

"Yes, Sergeant," said Winchendon, knowing there was a ton of steel under the most awful stress not twelve inches away. He powered down on the reverse throttle and kept pushing the vibrating forward throttle.

"What's going on down there?" shouted the speaker next to his ear.

"The bearing's freezing," croaked Winchendon, unable to stop his tears.

Service was dancing about the big six-inch gun, checking sights, making adjustments, and cuffing his gunners.

"Goddam you, Winch," he shouted at the corporal in the midst of his ministrations to the gun. "You break this machine's arm, and the Corps gonna dock your pay again."

"Yes, Sergeant," said Winchendon, regaining control. He threw in the clutch, then took it out again. He could see from his pointers that the arm was moving forward by inches under his manipulations. The groaning changed to a grinding and he thought perhaps that that was a good sign. Then it occurred to him that Service might have been joking about his pay being docked, but he didn't know for sure. He had never known Service to joke in such a friendly way.

Service had his head stuck out of the side of the gun port again. He brought it back in. "It's doing it," he shouted.

Winchendon could almost see the enormous arm outside shuddering and creaking and inching forward.

"Okay, Winch," shouted Service. "Power everything down, now."

Just then Winchendon could feel the rig come to a stop. The giant engine vibrated belowdecks, but the rig became immeasurably quieter as the clanking gears ground to a halt.

"Move now," said Service to his crew. "Captain will call for fire any minute."

Winchendon heard a dull thump and he knew the *Javelin* was being fired upon, that the Norman was knocking down buildings trying to range the American rig. He hated the Normans for involving innocent people in this battle.

There was a sudden roar and the crew of the *Javelin* were pitched violently. Winchendon was grateful for his gimbaled basket, which kept him from striking any of the bulkheads in the cabin. He got his swinging basket stopped and looked around with the feeling that the cabin suddenly had better lighting. Then he looked upward and realized there was no longer any ceiling. It seemed like hours before he came to the inevitable conclusion that the *Javelin* had lost its head, and with it, its captain, pilot, and Stevens, the gunner.

Service was bringing himself back to his feet, cursing. He looked up and took in the situation.

"Prepare to fire," he barked at the gun crew. But they were beyond hearing. One of them was nowhere to be seen, the other was wounded in the neck and looked to have another thirty seconds left in him.

The sergeant took the wounded man as gently as possible from the seat at the gun, heedless of the blood which splashed over the front of him. He half carried and half dragged the man aside and took his seat. He struck the big gun's firing button. The gun jumped back on its rails as the shell roared away.

"Wide, goddammit," he shouted. "Winch, you're going to have to take over loading. Fitzsimmons, get over here."

Winchendon pulled himself out of his basket and walked unsteadily toward the gun.

"Move, now, Winch," shouted Service. "The bastard's going to shoot again. Fitzsimmons, where are you?"

Winchendon looked over toward the other arm'sman. Under the streaming daylight, he could see that Fitzsimmons was dead. Most of the front of the man was a wound.

Service was muttering and making adjustments on the gun's sights. "Give me another shell in the chamber, Winch," he said.

Winchendon heard another whistling roar overhead and guessed that another shell was passing over, where the *Javelin's* head used to be. He jumped toward the shell rack and wrestled one of the big rounds onto the carrier. He pushed the carrier along its short track, with the red head of the round pointed toward the back of Service's gun. He put the brake on the little carrier, opened the gun's breech, and jacked the round into the chamber. He pushed the shell carrier back to the ammo rack.

Service punched the firing button. The great gun boomed and slid back into the cabin on its rails. Winchendon thought to look out the gun port for the first time and saw the largest steam rig he had ever seen, or could ever imagine. Half again as high as the *Javelin* (judging by a water tower close by), it had guns on its epaulets as well as in the chest and on the head. He knew it probably carried enough marines to subdue Boston easily. There was a flash and explosion at the machine's "shoulder," however, and Winchendon noted that its armament had been reduced by Service's marksmanship.

"Get that hatch open, Winch," said Service, nodding his head toward the hatch which led to the deck below. "You have to get down to Chief Duff and tell him to get underway."

Winchendon jumped over to the hatch, twisting the dogs open.

"Once we're underway," said Service, "get back up here and post one of those marine dandies to relay orders."



Winchendon threw the hatch open and climbed down the ladder into the next cabin. He climbed down as quickly as he dared and alighted among a platoon of marines.

"What's going on, Corporal?" said the blue-jacketed platoon leader.

"I have orders from Sergeant Service to the Chief Stoker," said Winchendon. He ran to the next hatch, the one leading to the engine room. He began working to get it open.

"When I come back," he said, loosening the dogs of the other hatch. "post your men along here to take the Sergeant's orders to the engine room." He got the second hatch open and jumped to the ladder, noticing the puzzled expression on the marine's face as he slid into the roaring darkness of the engine room.

"Chief Duff," he shouted at the stokers, who were shoveling dusty coal into the *Javelin's* furnace. One of the stokers, a bare-chested, heavyset man, separated himself from the crew. He wiped a grimy face with the dirty kerchief tied around his neck.

"Orders from Sergeant Service," said Winchendon. "Captain and the pilot are gone. We've got to get underway immediately."

Chief Duff didn't say anything, just turned and bent to his shoveling, with the other four stokers following suit. Winchendon scrambled back up the ladder and spoke to the marine who stood at the top.

"Is he going to want a boarding party?" said the platoon leader, nervously glancing toward the porthole which outlined the enormous Norman rig with its amputated arm.

"Your guess is as good as mine," said Winchendon, bounding toward the second ladder. "Post some men to instruct the legsmen here." He pointed to the ends of the cabin, then began climbing up the ladder.

As he reemerged into the chest gun cabin, Service was reseating himself at the gun, having just completed another loading. The sergeant punched the firing button. The gun boomed and slid back on its rails. The *Javelin* suddenly jerked into motion and began to hulk forward.

"Winch," shouted Service, "tell them fifteen degrees left. Then full ahead. We've got to get to the River. We might be able to get supporting fire from the Revenue Cutters."

"Brake the left leg," shouted Winchendon to the marine at the bottom of the ladder as he calculated the adjustments to implement Service's orders. "Three swings."

He heard marines repeating the orders to each other. He looked back out the gun port. It seemed an eternity before the *Javelin* began to turn at all.

"He isn't much of a marksman," said Service, getting up from the gun to wrestle another round onto the loading carriage. "And he probably won't follow immediately. We don't pose much of a threat and with a new rig like that, the captain will want a complete damage report before he takes up the chase."

The *Javelin's* top speed was cut by five miles per hour or more, due to the absence of arm swing and a lot of other damage. Winchendon wondered how the machine must look. It walked, headless, through the streets of Somerville, one arm outstretched, the other down. Doubtless they were scattering horses, people, and dogs.

He looked out the gun port, however, and noticed for the first time that the streets were deserted. A steamrig within the city limits was a novelty, but the artillery duel had obviously frightened away on-lookers.

It took twenty minutes for the crippled *Javelin* to navigate the five miles to Charlestown and the riverside. Winchendon felt apologetic about the damage it was doing to local structures, but he knew there was nothing Service could do about it, even if he thought the sergeant cared enough to prevent it. The system of getting orders to the engine room and the two legsmen was so cumbersome as to make real maneuvering impossible.



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The riverside area, however, is a manufacturing district and, once there, Service was able to position the machine among the tall buildings, so that it was effectively hidden. He and Winchendon had a view which encompassed part of the river and part of Charlestown toward Cambridge. There were small boats, mostly Revenue Cutters, chugging up and down the river. Civilian boat traffic seemed to be thinning out rapidly.

The *Javelin's* engine vibrated belowdecks as Chief Duff and his crew kept the furnace stoked for as much power as they could get at idle.

"What are you going to do, Sergeant?" said Winchendon.  
 "Knocking off that arm was a lucky shot," said Service.  
 "Arms are never as heavily armored as the rest of the rig. We can't hope to do that kind of damage to it again if we keep firing from a distance. I don't know what to do."

Their first indication of the Norman's approach was the screaming of a horsedrawn fire engine which careened around the corner a block away and then proceeded northwest. The horses were at full gallop and Winchendon could see gobs of foam running from the mouth of one. No sooner had the fire engine disappeared than a "platoon" of the local militia came running down the street in the opposite direction. They needed organization badly and Winchendon shuddered to think what the crack marines in the Norman steam rig would do to them once they were trapped at the edge of the river. Then the Norman appeared on the horizon, looming over the foreground buildings like a hemiplegic monster. At 150 feet, it towered over the structures of Cambridge and Charlestown. It was not using its guns, but simply walked with metallic confidence, smashing structures and crushing the citizens who got in its way. It appeared to be walking southeast toward the harbor area.

"It's in range now, Winch," said Service. "Get on the shell loader." The gunnery sergeant bent to his levers and screws.

Winchendon wrestled another round into place for firing.  
 Service looked up. "It's no good," he said. "If we shoot now, we aren't going to do it any damage, but we will alert it to our position."

Winchendon watched the enemy machine moving inexorably southward.

"Tell the Chief to prepare for full speed," said Service.

Winchendon jumped over to the hatch and shouted at the marine who was grasping the ladder at its base.

"Prepare for full ahead," he shouted.

He went back to look out the port.

"Our best hope is if we can sneak up on it," said Service. "But I don't see how we can do it."

Just then they noticed a small explosion near the rig's head and noticed it was taking fire from someplace else. Shells began bursting around the machine. The barrage was coming from the river, where the small Revenue Cutters were firing with their tiny six-pounders. The enormous rig stopped and began to range itself for return fire.

"Now," shouted Service. "Full ahead."

Winchendon jumped back to the hatch.

"Full ahead!" he shouted.

He heard the marines repeating the order belowdecks. In less than a minute the *Javelin* roared into motion.

"Winch," shouted Service, "we'll connect in a few minutes. Let's just hope he misses when he fires on us."

Winchendon got up and went back to the gun port. He looked out at the Norman machine almost half a mile off. It was still preoccupied with the Revenue Cutters.

The *Javelin* rocked and swayed as the legsmen took it through its most rapid stumbling gait.

"Give me a two degree left correction," shouted Service.

Winchendon ran to the hatch and shouted the orders to the waiting marines, who relayed them.

The *Javelin* was closing the gap between itself and the Norman colossus.

Back at the gun port, Winchendon saw the giant machine

begin to turn toward them.

"He sees us now," shouted Winchendon.

"He has time for one shot," said Service, "before we ram him and disembowel him. Let's hope he is true to form."

They saw the Norman's chest gun cough smoke and a shell roared overhead to splash into the Charles River.

"It's a good thing that chest gunner is such a bad shot," said Service, laughing.

The Norman machine loomed before them and filled the entire gun port. Winchendon grabbed a cabin strut to brace himself, just as the *Javelin* ground suddenly to a stop, and everything was pitched forward. He knew his rig's upraised arm was striking the Norman machine about fifteen feet below its chest gun port. It was the first time a steam rig had ever physically grappled with another. For an instant, he wondered if this maneuver would be known as "Service's Stiff Arm."

He looked up through the opening where the *Javelin's* head used to be and thought he noticed the Norman machine actually rocking under the impact. He could see panic-stricken expressions on the faces of the rig's two pilots and he knew that they must mirror his own.

Service was still at his post. "We won't miss this time, Winch," he said. The gunnery sergeant punched the firing button for his big gun again. There was a roar and everything went black.

Winchendon came around slowly. It was quiet and bright and he wondered if he were dead. It hurt him to breathe, however, so he assumed he was somehow still alive. He opened his eyes carefully and saw Service, with a complicated bandage covering the top of his head, standing at the foot of his bed. Bed?

"How do you feel, Winch?" said Service.

"I hurt all over," said Winchendon.

"Doc says you have a couple of broken ribs, but that seems to be the worst of it."

"What happened to you?" said Winchendon, trying to gesture at Service's bandage.

"Grazed by shrapnel," he said and shrugged. "It hurts a lot, but it wasn't much damage. I got one of the nurses to make the bandage look real serious, though. I don't want to go back to duty right away."

"What happened?"

"I'll be serious with you, Winch," said Service. "When I fired the six-inch gun at point blank range, I didn't expect any of us to survive it. I thought it would damage us as much as the Norman. It didn't, though. As near as I can make out, the shell passed right through the Norman's armor. Armor's not built to stand up to a cannon shot from point blank range. If we'd even had a little bit of distance, it would have had the muzzle velocity to bust things up more. That's what would have taken us with it. This way, though, it just passed right through. And coming out the other side, it passed through the engine room. The Norman went up like fireworks, blown up by its own head of steam."

"We took a lot of shrapnel. Only eleven of us got through, but none of the Normans made it. They were closer to their own boiler than we were. We were protected by our own rig and the front of theirs. The explosion went out the back."

"Who survived?"

"You and I made it, and all the stokers. Most of the marines were killed, though. They were disembarking the *Javelin* and didn't have the protection we had. I like to think they were getting out to form a boarding party."

"Yeah," said Winchendon.

"Well, I got to go now," said Service. "There are some sailors off a revenue cutter down from Gloucester who say they want to buy me a drink."



fool. If that's what you want, all right. You can stop now. Do you hear me? Please stop now," she begged and he realized that like a turtle on its back, he was still trying to turn over and crawl to the doorway.

He woke in a moving hover, to the sky racing past, and he woke again in Leo's lab while the machines were copying his mind, making a record of his memory for the him that would be. After that, there was a long period of dreamless sleep. Then dreams came and with them, the night machine but it no longer clanked and rumbled, but hummed softly. He woke to find that he was in a hover once more. Dyane was piloting it and there were still tear tracks down her intricately patterned cheeks.

He struggled weakly against the stretcher he was strapped to and she whispered, "It's all right. It's done. It's almost over now." He believed her and lay quietly.

The party was twice as loud as it had been before. A dozen or more people came crowding up to Dyane when she got out of the hover, laughing and pulling at her. "Where have you been? Have you forgotten this is the day for your new skin? Everything is ready. We've got to go now." None of them

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spared more than a glance for Alec on the stretcher, for which he was grateful.

Dyane pulled away from them and looked down at herself. She pushed up her sleeves and stared at the patterns on her arms. The others stood back and looked at her too. She smiled at them. "I'm not ready to shed myself just yet," she said.

She ignored their protests and, picking out the two strongest, had them carry Alec's stretcher to his room. When they had gotten him into the robo-nurse, she cleared the room. "Leo is coming by as soon as he is sure everything is all right. He said he would bring you what he promised. He said to wait for him." She looked at his poor battered body doubtfully. "Can you wait for him?"

"I can wait," he whispered. But he couldn't wait with his eyes open. The lids were too heavy and the pain was too great. He closed his eyes and let himself drift down into the warm softness of somewhere deep inside himself and as he was drifting he heard her voice close to his ear for himself alone. "I came with you this time, Alec. Remember that. I came with you."

He could not solve the riddle in her words but the warmth in her voice was what he needed to ease the pain and help him find peace, and he slept.

There were long slivers of moonlight in the room when he

woke again and for a moment they looked like gigantic teeth. When he shook himself free of the robo-nurse's coils, shadows stirred in the darker recesses of the room. The shadow in the corner with the pale round face was Leo and the other shadow clothed in herself was Dyane. When they saw he was awake, they exchanged glances, and he saw that they had come to some mutual understanding.

Dyane got up and left the room and Leo walked over to his side. "Nothing can stop us now," he said. "You're free." But he was no longer the genial madman. Something had changed.

"Dyane helped me?"

"After she tried to stop you. She told me that. She told me why."

"Tell me."

"Because of this." He handed Alec a small brown bottle. "Because she knew that after that came this and she was going to lose you again."

Alec took the bottle and held it tightly like some rare and precious jewel he was afraid might slip from his grasp. "You're sure?" he asked Leo. "You're positive that nothing can stop it now."

"I'm sure."

"Then I want to be by myself."

"Certainly," Leo said, but he remained a standing by the bed.

"There's something else."

"I didn't know she was going to do it. And you won't know until the computer tells you. I swear, Alec, I didn't know what to do. She insisted." Of all the strange sights Alec had seen in his life, this was the strangest, tears streaming down Leo's round face. "I had to let her do it. You understand that, don't you, Alec. Only it makes everything different, don't you see."

He gripped Leo's wrist and was surprised to find that Leo could not pull away. "What did she insist on doing?"

"She went with you. She had me take her cells as well, and she made the tapes. She'll be with you in that ship. Only you won't know until after the computer tells you because that was after your tapes were made." The tears streamed down his face. One splashed on Alec's hand and he jerked it away as though it had burned. "You're different, Alec. You'll never stop struggling. That's why I knew you would be perfect for the probe. You'll never give up until you know there is someone to take your place and even then... But she only went because she loves you." Leo buried his face in his hands and Alec could hear his muffled words. "I'm not going to be able to sleep." Then, because Leo too was strong in his own way, he pulled himself together and stood up. "You're well out of it," he said. "I'll do what I can for her before I go."

He left and Alec was alone with the small brown bottle. It seemed to glow with a warmth of its own against his palm. That was it, then, everything settled and the future assured. The small brown bottle held the end of life and the end of pain. They were one and the same and all he had to do was drink.

He unscrewed the lid with trembling fingers, thinking only of the tiny bit of self he had sent seeking other stars. The lid came free and dropped to the sheets. He stared into the open mouth of the bottle and thought of Leo unable to sleep. He thought of Dyane, at home at last in her own skin. He turned his wrist and let the liquid dribble out on the floor. The empty bottle slipped from his fingers.

He would struggle on a little longer. He could do that.



# JEM

by Frederik Pohl

## Part 5

**F**IRST PRIORITY WAS TO get everything movable inside the perimeter of the camp. That meant organizing working parties and armed guards to go with them. No Kripit had been spotted near the landing site, but the woods were full of them. It wasn't until the first detachments began straggling back with cases of food and boxes of microfiche, folded bicycles and crates of electronic parts, that Margie relaxed long enough to greet the new arrivals. She shook each hand, spoke each name, and turned them over to Santangelo for assignment to quarters. A short black major hung behind. "I've got something for you, colonel," he said, patting a dispatch case. "In private, if you please, ma'am."

"Come ahead, Vandemeer, is it?" He nodded politely and followed her into her office, where he placed his dispatch case on her desk.

"This is it, ma'am," he said, unsnapping the case.

It was not a dispatch case. When he had undone the snaps the side peeled back and revealed a microprocessor with a liquid-crystal panel. He touched one of the buttons and it sprang into light, displaying a row of close-typed symbols.

"There's your guidance, ma'am. There are twelve satellite busters in orbit, and these are the controls."

Margie touched it. A warm feeling grew in the pit of her stomach and spread, an almost sexual excitement. "You're checked out on this, Vandemeer? Can you locate the Greasies' satellites?"

"Yes, ma'am. We've got acquisition and lock on four of theirs, including their main tactran receiver. Also the Peeps; they have two, but they don't seem to be active." He expertly punched a combination into the processor, and the colors of the symbols changed. "Green lights are ours. Red are Peeps. Yellow are Oilies. The lines that are still white are standby. If anything else comes within two million clicks the guidance system will track and identify it, and one of the spare birds will lock on."

"Thanks, major," she said. "I want you to show me how to work this thing, and from then on I want it in your possession or mine, twelve hours a day each, until further notice."

"Yes, ma'am," he said unemotionally. "And I have something your father asked me to hand to you personally."

It was a letter, not a microfiche. A paper letter, in an envelope with her name on it in Godfrey Menninger's own handwriting. "Thanks, major," she said again. "Go and get settled in, and take the controller with you." As she turned, she said, "Major? Are things pretty bad at home?"

He paused, looking at her. "Pretty bad," he said. "Yes, I would say that, colonel. They're pretty bad."

Margie stood holding the letter for a moment. Then she jammed it in her pocket and went out to see how the loading



Tom Barrett

was coming along, because she wasn't quite ready to get the uncensored word on how bad "pretty bad" was.

Putting it away did not let her forget it was there. While she was chewing Sergeant Sweggert out for talking up two of the new girls when he should have been shifting cargo, she was fingering it. When she was breaking up an argument over what had become of a case of flashlights—"Jesus, colonel, I just put them down for a second; I thought one of the other guys took them!"—her hand returned to it. When the mess tent called a halt for breakfast, she could resist no longer, and she took her tray and her letter back into her office and ate while she read.



Marge, honey,

You've got it all, everything on the list. But there's no more where that came from. The Greasies have ordered our rigs off the Mid-Atlantic Ridge. It's a bluff. We're calling it. But every drop of booster fuel is now sequestered for missiles until they back down—and then there's Peru. The Peeps have flanged up a phoney "election," and we're not going to sit still for it. So we'll be at full military alert for months to come, maybe longer than that.

You're on your own, honey. Figure at least a year. And it may be more than that, because the President's being

threatened with impeachment, maybe worse—there was an assassination attempt with two National Guard tanks last week. I told him what to do. Declare martial law. Send Congress home. Crack down all around. But he's a politician. He thinks he can ride it out. If he does, that means the rest of his term he'll be trying to score brownie points with the voters, and that means cutting back a lot of important programs.

And one of them might be you, honey.

I wouldn't be telling you this if I didn't think you could handle it. But it looks as if you'll have to.



That was all, not even a signature. Margie sat with the letter in her hands and minutes later noticed that she had forgotten to finish her breakfast.

While Sergeant Sweggett was eating he heard two sounds, not very near and not very loud. They sounded like shots. No one else in the mess tent seemed to have heard anything. He scraped the plate of its canned ham and dehydrated eggs, picked up the big chunk of bread, and strolled toward the entrance, still chewing.

There was a third shot.

This time there was no mistake. Some dumb son of a bitch was playing with his piece. You couldn't blame him—if Sweggett got a Kripnit in his sights he would have been tempted to blow it away, too. But three shots was wasting ammunition. He speeded up and headed toward the perimeter. As he rounded the cook tent he saw a dozen people standing around the uphill emplacement peering up the trail toward the spot where the resupply ship had landed. Others were converging on the post, and by the time he had reached it there were twenty, all talking at once.

The shots had come from the trail. "Who's out there?" he demanded, grabbing Corporal Kristianides by the shoulder.

"Aggie and two grunts. They decided to get another load in before they bucked the chow line. Lieutenant Macklin just took a patrol up after them."

"So sit down and shut up till they get back," Sweggett ordered; but it was an order he didn't want to follow himself. It wasn't like Aggie to shoot up the jungle. The crowd was getting bigger; Colonel Tree came trotting up, looking like a little China doll, then half a dozen from the mess tent, then the colonel herself. Ten people were all talking at once, until the colonel snarled, "All of you, at ease! Here comes Macklin. Let's see what he has to say."

But Macklin didn't have to say a word. He came stepping along the worn place that had become their path, carbine at port arms, looking both ways into the jungle. As he got closer they could see that the two men behind him were carrying someone, and the last soldier was backing toward them, carrying her weapon as Macklin carried his.

What they were bringing in was a body. It was female, and that was all that you could say. The face was unrecognizable. When they dropped her down, it was plain that not only the face had been attacked. One arm was shredded up to the shoulder, and there was a bullet hole between her breasts.

"Kripnit," snapped Major Santangelo.

"Kripnit don't have guns," said Colonel Menninger, tight-lipped. "Maybe Kripnit, but they had company. Tree! Check the perimeter. I want every weapon manned and a reserve at every point. Santangelo, fall the off-duty troops in. Give Sweggett and me two hundred meters, then follow us. Sweggett, take three people, and you and I are going to take the point."

"Yes'm." He spun around, took Corporal Kristianides's gas-operated recoilless away from her, and picked three from his squad at random while Colonel Menninger was listening to Lieutenant Macklin's report. He had got only about halfway up the trail, where he found the casualty and a couple of spilled and ransacked cases of supplies. Where the other two were he didn't know. He had come back for reinforcements. Marge Menninger listened to no more. She turned him over to Major Santangelo and signaled Sweggett to move in.

At twenty-second intervals they dogged it across the open space that was the field of fire, reforming under the arch of a many-tree. As Sweggett waited for the others, he could hear the rattle and moan of some shelled creatures, but not very near. The next man heard it too and turned a questioning face to Sweggett, mouthing the word *Kripnit*. Sweggett nodded savagely and motioned silence. When Colonel Menninger crossed the field of fire, she trotted ten meters past them, then dropped to a knee and looked around warily before raising a

hand and ordering them in.

Fucking hairy, thought Sweggett. It was like that bitch to pick him for something like this! She'd had it in for him ever since he had it in her. He hand-signaled the rest of the patrol to move up one at a time, two on one side of the trail and the other with him and the colonel on the other, and when they had made their run he waited ten seconds and then sprinted to drop down beside the colonel. "That's where they got her," he breathed, pointing ahead on the trail, where half a case of fluorescent tubes lay crunched and scattered on the ground.

"I see that, sergeant! Keep moving, I don't want Santangelo running up my ass."

"Yes'm." He stooped low, dodging through the underbrush, and flopped down. The distant Kripnit rattle was still audible, but not closer. The patrol leapt through the jungle until the bulk of the resupply ship loomed ahead, with its tramped-down clearing before it. He waved to catch Colonel Menninger's eye, then pointed to the top of a many-tree. She nodded, and when his turn came again he raced for the nearest of its trunks, slung his GORR over his shoulder, started up the clump of growth. It was not much like climbing a real tree; it was easier. The flat, arched branches were like a series of steps, and the stalactitic growths that hung down between them made good handholds. The problem was that it was hard to see. Sweggett had to change position twice before he could get a clear view of the rocket.

What he saw was the base of the ship, and right in front of it the bodies of the two other grunts. They had been savagely mutilated. There was no sign of Kripnit, and the sounds he had heard seemed to have gone farther away.

Sergeant Sweggett began to feel a little better. Why the fuck should he worry about Kripnit? They were noisy bastards; there was no way one of them could get within twenty meters without him hearing it. And then the GORR would take care of it. Of course, he speculated, maybe they weren't alone. Maybe there were a couple of Greasies with them. But what did that matter? Greasies were Greasies—they were spics, Ay-rabs, or limeys—and the day hadn't come when he worried about meeting one of them in the woods. He pushed his cap back and settled down. If anything showed up in that clearing he would blow its ass off, and meanwhile he had entertaining spectacle of Margie Menninger silently worming her way forward on the ground, almost right under him. Off to the other side of the trail somebody else was moving, equally silently; he swivelled the GORR to sight in on it, but as the figure slid between bushes he saw that it was one of his own patrol. He returned the gun and slowly centered it on Marge Menninger, moving the cross hairs in the reticle down from the base of her skull to her hips. Wouldn't it be nice, he speculated, if he could give her one she'd never forget, right up the old...

The faintest of sounds behind him made him freeze.

A little too late, he comprehended a mistake in his thinking. Kripnit and human beings were not the only creatures on Jem. As he started to turn he saw a skinny, stretched-out creature, longer than he was tall, climbing toward him with at least half a dozen legs, while others held what looked like some kind of gun. The damn thing was wearing sunglasses, he thought with surprise, trying to bring the GORR around. He was too slow. He never heard the shot that went through his head.

Marge Menninger was the first one back into the camp. She didn't wait for the cleanup; once they knew what they were looking for, the forty armed troops scoured the area. All they got was three of the burrowers, but one of them was the one who had killed Sergeant Sweggett. You were always a lucky son of a bitch, she thought; now you don't have to worry about a court-martial for rape anymore. She collared a passing man and sent him running toward the communications tent, and before she was in her office she heard the announcement coming over the PA: "Major Vandemeer! Report to the colonel

on the double!"

She met him at the door. Good man, he was trotting over half-dressed, but he had the case with him. "Open it up," she snarled. "They're arming the Creepies against us, guns and glasses. That's what Tinka was trying to get back to tell me. Move it, man!"

"Yes'm." But even the stolid Major Vandemeer fumbled as he undid the snaps. "Ready, ma'am," he reported, fingers poised.

The red fury in her mind was balanced by the warmth spreading at the base of her belly. She scratched vigorously and snapped, "Take 'em out!"

"Who, ma'am?"

"The Greasies! Bust their birds, all of them!" She watched the complicated ritual and then frowned. "While you're at it, take the Peeps' out too."

## XIX

GODFREY MENNINGER WOKE UP wondering who was shaking the foot of his bed.

No one was. He was alone in his room, exactly like a hundred thousand Holiday Inn or Howard Johnson's Motor Lodge rooms all over the world. There was the phone on a nightstand table beside the bed, the TV set staring grayly across at him from the long desk-plus-chest-plus-luggage-rack that stood against the wall. The phone was almost the only visible element that made it different, for it was a pushbutton jobber with colored lights flickering across its face. The other element of strangeness was harder to see. The drapes over one walls covered an immense likris display panel, not a window. There was no point in having a window. He was two hundred meters under the earth.

It was 6:22 on the clock.

Menninger had left orders to be awakened at seven. Therefore it was not a call that had awakened him. Therefore there were only a couple of other possibilities, and neither of them was attractive. God Menninger considered picking up the phone or switching on the TV or pulling back the drapes over the likris situation screen, any of which would have told him at once what was happening. He decided against doing so. If it had posed an immediate threat, he would have been notified at once. Margie's disciplined and heirarchical approach to problem-solving had not been taught at West Point, it had come to her on her father's knee. If she was good at putting unwanted thoughts out of her mind, he was superb. He dismissed the question, slipped into his broadened robe, went into the bathroom and made himself a cup of instant coffee with tap water.

God Menninger's waking-up minutes were precious to him. He was of the opinion that both his marriages had failed because he had been unable to make either wife understand that he was never, not ever, to be spoken to for at least half an hour after waking. That was coffee time, and summoning-up-strength time, and remembering-what-he-had-to-do time. Conversation destroyed it. A weakness in Godfrey Menninger's character was that he was apt to destroy anyone who infringed on it.

The coffee was at just the right temperature and he drank it like medicine, swallow by swallow, until it was down.

Then he threw off the robe, sat cross-legged in the half-lotus position on the bed, let his body go calm and began to say his mantra.

Godfrey Menninger had never really understood what happened among his neurons and synapses when he practiced transcendental meditation, nor had he ever really tried. It did not seem to do any harm of any kind, except to cost him twenty-four hundred seconds out of every twenty-four hours. He seldom discussed it with anyone else and therefore did not have to defend it. And it seemed to work. Work how? Do what? He could not exactly have said. When he did it, he felt more

confident and more relaxed about his confidence. That was not a bad return on the investment of less than three percent of his time.

As he sat, his body withdrawing from him, the reiterated *ta-lenn, ta-lenn* of the mantra becoming a sort of drapery of sound that surrounded him without being present, his whole brain became a receptor. It contributed nothing. It only perceived. On the inside of his eyelids he saw faces and shapes that melted into each other. Some were beautiful and some gargoyles. Some were etched in the sharpest of drypoint lines. Some seemed to be beaten out of gold. They held no emotional content for him. The demon snarls did not frighten. The loveliness did not attract. They were only there. Wispy chains of words floated past his consciousness, like snatches of conversation from the next table at a restaurant. They spoke of ultimatums and megatonnages and a remembered caress and the need for a haircut, but there were no imperatives in them anywhere. The circulating memory that pumped them past his mind sucked them away again without residue.

More than two thousand kilometers away and half a kilometer down, inside a submarine belonging to the Fuel Bloc, a vice-admiral in the Libyan navy was programming The One That Had His Name on it. Menninger did not know it. His thoughts floated free into infinity in all directions, but all the directions lay within that inner space of his mind. He could not have done anything useful about it if he had.

The bed moved again.

It was not an earthquake. There were no earthquakes in West Virginia, he thought, bringing himself up out of reverie, getting ready to open his eyes. It was sharper than an earthquake would have been, more quick and trivial than the slow battering of a crustal slip. It was not particularly strong and if he had been still asleep, it might not even have awakened him. But it was something. And then the lights flickered.

Two hundred meters down in the side of a West Virginia mountain the lights were not meant to flicker. A Pu 235 megawatt generating plant, vented through a kilometer of piping to emerge on the other side of the hill, was immune to most external events. Lightning bolts did not strike transformers underground. Winds could not tear loose a line since there were no lines in the open air. And then, tardily, the flickering colors on the base of the telephone all went out. A single red light flared and the buzzer sounded. He picked up the phone and said, "Menninger."

"Three missiles came in, sir, near misses. There's no structural damage. Point of origin backtracks probably to near Sinkiang Province. The city of Wheeling is out."

"I'll be there in a minute," he said. He was still coming up from his meditation and so he did not look at his own situation panel, but he also did not stop to shower or shave. He rubbed deodorant on his armpits, French whore's bath but good enough, ran a brush over his hair, pulled on his coveralls and shoes and walked briskly down the placid, beige-carpeted corridor to his command room.

The situation map was alight from end to end.

"Here's your coffee," said General Weinstat. That was all she said. She knew his ways. He took the cup without looking at her because his eyes were all on the board. It displayed a Mercator projection of the Earth in outline. Within it, bright red stars were targets taken out. Bright blue stars were also targets taken out, but on the wrong side: That was Washington and Leningrad and Buenos Aires and Hanoi and Chicago and San Francisco. Broken red profiles in the ocean areas of the map were enemy missile-launching vessels destroyed. There were more than a hundred of them. But there were also nearly sixty major concentrations not yet destroyed. There were relatively few of them. The number decreased as he watched. Kansas City, Tientsin, Cairo and the whole urban complex

around Frankfort ceased to exist.

The second cup of coffee was not medicine but comfort. He took a sip of it and then asked, "What's their remaining second-strike capability?"

"Marginal, Godfrey. Maybe one hundred missiles operational within the next twenty-four hours, but we're cutting that down all the time. We have almost eighty. And only two of our hardened installations are scratched."

"Local damage?"

"Well—there are a lot of casualties. Otherwise not bad. Surface contamination is within acceptable limits, anyway inside shielded vehicles." She signalled an orderly for a coffee refill and added, "Too early to tell about long-lived isotope capture, but most of the corn belt looks okay. So's Mexico and the Pacific Northwest. We did lose the Imperial Valley."

"So we're not bad for now."

"I would say so, yes, God."

"For the next twenty-four hours. Then they can start to redeploy." She nodded. It was a known fact that every major country had squirreled away missiles and components. They were not at ten-minute command like the ones in the silos or on the subs. They could not be launched by pushing a button. But they could not be taken out at long range, either, since you didn't know where they were hidden. He added, "And we can't look for them, because the satellite-busters have half-blinded us."

"We've half-blinded them, Godfrey. They don't have an eye in orbit."

"Yes, yes, I understand," he said testily. "We've won the exchange. The damn fools. Well, let's get to work."

Menninger's 'work' was not directly related to the exchange of missiles that was remodeling the surface of the Earth closer to Hell. That was not his responsibility. It was only a precursor, like a friend's retiring to the bathroom to fit in her diaphragm while he slouched waiting on the edge of the bed. She would not need his advice or his help at that stage and neither would the Chiefs of Staff while the actual fire-fight was going on. His involvement would be central immediately thereafter.

Meanwhile, one of the damn fools had finished the programming and was trying to round up enough of a crew for the launch. It wasn't easy. The neutron bomb had done just what ERW weapons were supposed to do, penetrated the carelessly scant meters of water and the steel tube of his submarine and knocked out most of the crew. The Libyan vice-admiral himself had taken nearly five thousand rads. He knew he had only hours to live but with any luck, his target would have less than that.

Three hours' sleep was not enough. Menninger knew that he was quick-tempered and a little fuzzy, but he had trained his people to know that too and they made allowances. At five-minute intervals the map disappeared and the likris screen sequenced itself through a round of ten-second displays: profiles of industrial capacity destroyed and remaining, curves of casualties, histograms of combat-effectiveness estimates.

In the OpsRoom next to God Menninger's command post, more than fifty persons were working on overdrive to correct and update those figures. Menninger hardly glanced at them. His concerns were political and organizational. Rose Weinstein was on the scrambler to the Combined Chiefs every few minutes, not so much to give information or to get it as to keep them aware, every minute, that the most powerful unofficial figure in government had his eye on them all the time. His three chief civilian liaisons were in touch with state governments and government agencies, and Menninger himself spoke, one after another, with cabinet officers, key senators and a few governors—when they could be found. It was all U.S., not Fats; the rest of the Food Bloc was in touch through the filter of the Alliance room and when one of them

demanding his personal attention, it was an intrusion.

"He isn't satisfied with me," General Weinstein reported. "Maybe you should give him a minute, Godfrey."

"Shit," Menninger put down his pen at the exact place on a remobilization order where he stopped reading and nodded for her to switch over.

The face on his phone-screen was Marshal Bressarion of the Red Army but the voice was his translator's. "The Marshal," said her voice, tinny through the scrambler, "does not question that you and the combined chiefs are acting under the President's orders but he wishes to know just who the President is. We are aware that Washington is no more and that Strongbox One and Two have been penetrated."

"The present President," said Menninger, patiently restraining his irritation, "is Henry Moncas, who was the Speaker of the House of Representatives. The succession is as provided in our basic law, the Constitution of the United States."

"Yes, of course," said the translator after Bressarion had listened and then barked something in Russian, "but the Marshal has been unable to reach him for confirmation."

"There have been communications problems," Menninger agreed. He looked past the phone, where Rose Weinstein was shaping the words 'in transit' with her lips. "Also," he added, "I am informed the President is in the process of moving to a fully secure location. As the Marshal will realize, that requires a communications lid."

The Marshal listened impatiently and then spoke for some seconds in rapid-fire Russian. The translator sounded a good deal more uptight as she said, "We quite understand, but there is some question of lines of authority and the Marshal would appreciate hearing from him directly as soon—hello? hello?"

His image faded. General Weinstein said apologetically, "I thought it was a good time to develop transmission difficulties."

"Good thinking. Where is the son of a bitch, by the way?"

"Henry? Oh, he's safe and sound, Godfrey. He's been ordering you to report to him for the last hour or so."

"Um," Menninger thought for a moment. "Tell you what. Send out a radiation-safe team to escort him here so I can report. Don't take no for an answer. Tell him he'll be safer here than in his own hole." He picked up the pencil, scratching the pit of his stomach. Which was complaining. He wanted orange juice to build up his blood sugar, a stack of flapjacks to give a foundation for the next cup of coffee, and that cup of coffee. He wanted his breakfast and he was aware that he was cranky because he was hungry. "Then we'll see who's president," he added to the air.

On the edge of the Bahia de Campeche the Libyan admiral had got his crew together and his submarine up to two hundred meters, running straight and level. None of them were functioning well, with prodromal diarrhea and vomiting often enough so that the whole ship smelled like a latrine, but they could serve. For a while, at least. They did. Libya's naval doctrine called for one big missile instead of a few dozen little ones. As the big one broke the surface of the Gulf, it was immediately captured by a dozen radars. The scared but as yet untouched tourists on their lanais in Merida saw bright, bad flashes out west, over the water, as a Cuban cruiser locked in and fired ABMs. None of them caught it. It was a cruise missile, not ballistic, easy to identify but hard to predict as it drove itself north-northwest toward the Florida panhandle. A dozen times defensive weapons clawed at it as it crossed the coast, and then it was lost to view. There were plenty of installations along the way charged with the duty of detecting and destroying it, but none that were functioning any more.

The latest picture from Margie showed her with one foot on the shell of a dead Krimpit, looking tired and flushed and

happy. It was as good a picture of his daughter as God had had since her bearskin-rug days, and he had it blown into a hard print for his wallet. General Weinstein looked at it carefully and passed it back to him. "She's a credit to you, God," she said.

He looked at it for a moment and put it away. "Yeah. I hope she got her stuff. Can you imagine her mother? I told her Margie wanted some dress patterns, and she wanted me to put in about a thousand meters of fabric."

"Well, if you'd left her raising to her mother—wait a minute." General Weinstein touched the thing that looked like, but wasn't, a hearing-aid in her ear. Her expression turned somber.

"What is it?"

She turned off the communicator. "Henry Moncas. His shelter took a direct hit. They're trying to find out who's President now."

"Shit!" Godfrey Menninger stared at the remains of his tray of breakfast for a moment and saw none of it. "Oh, shit," he said again. "It looks bad, Rosie. The worst part is we never had a choice!"

General Weinstein started to speak, then changed her mind. "What? What were you going to say, Rosie?"

She shrugged. "No good second-guessing, is it?"

He pounced on her words. "About what? Come on, Rosie!"

"Well—maybe moving into Canada—"

"Yeah, That was a mistake, all right. I'll give you that. But not ours! The Greasies knew we couldn't let them move troops into Manitoba. That was Tam Gulsmit's mistake! Same with the Peeps. Once we were engaged we had to take Lop Nor out—quick, clean, minimum casualties. They should've accepted it instead of retaliating—"

But he could hear voices within him denying it, speaking in the tones of Tam Gulsmit and Heir-of-Mao. "We were safe moving troops in to protect the tar sands because we knew you couldn't afford to invade." "You shouldn't have bombed Lop Nor. You should have known we would have to retaliate." The voices within God Menninger's mind were the only voices they would ever have again. Heir-of-Mao lay with his eyes bulging and tongue protruding from his lips, dead in the deep shelter under Peking, and the atoms that had once been Gulsmit's body were falling out from the column of fire over Clyde-side.

The Libyan missile had by-passed Atlanta and Asheville and Johnson City, matching their terrains against the profiles imprinted in its memory. The safety interlocks on its thermonuclear charge were falling away one by one as its tiny, paranoid brain began to recognize the nearness to the thing it was unleashed to destroy.

"It's bad, Rosie," said Godfrey Menninger at last, rising to return to his desk. Maybe he should have let Margie's mother have the raising of her. Then Margie would probably have a husband and a couple of kids by now. And perhaps—perhaps the world would have been a different place. He wondered if he would ever hear from her again. "Rosie," he said, "check Houston. See if the communication links with Jem are holding up. With the other colonies, too, of course."

"Right now, godfrey? Give me ten minutes; I've got a call coming in from the DoD."

"Ten minutes is fine," he said; but before the ten minutes were up he was dead.

## XX

THE CORACLE FIRST APPEARED between showers, far out over the water. In the pit beside Ana Dimitrova, Corporal Kristianides—no, Lieutenant Kristianides now, she corrected herself—stood up and turned the field glasses on it. "Krinpit," she said. "Son of a bitch. Lay your gun on it, Nan, but don't fire unless I tell you to."

Unnecessary order! Not for worlds would she have fired. Not until she saw for herself that there was only Krinpit in the boat, and not Ahmed Dulla. Perhaps not even then, for this insanity of guns and shooting was awful even to play at. She had not yet had to fire at a living being and was far from sure that she could; she had said as much, but no one wanted to hear. The good thing about her machine-gun was that it had a telescopic sight and she was glad enough to aim it.

The coracle disappeared into a squall but not before she had seen that there was no human being in it, though it was large enough for several.

When it appeared again, it was larger and nearer and she could see that the single Krinpit was working furiously to keep it bailed and the trapezoidal sail intact, and paddling to bring it straight in to the camp. By then everyone had seen it and at least a dozen weapons were pointed at it. Over the P.A. system Guy Tree's voice shrieked an order to hold fire. Down on the beach Marge Menninger stood, a GORR under her arm, oblivious of the rain that soaked her. Ana wiped the wet off her sight, as carefully as she had been taught, and looked again. She had no skill at recognizing individual Krinpit by sight, but this one did not look familiar.

A disappointment of a hope. But what a foolish hope, she scolded herself. How improbable that Ahmed would once again miraculously appear. And even if he had, who was this Ahmed who had taken her, and used her, and left her again? He was not the person of Sofia, she thought gloomily, and roused herself and tried to think more constructively.

It was a failure. There was so little to think constructively about! The world she had left was blowing itself up and the world she had come to seemed determined to do the same. What went on in the secret conferences among Marge Menninger and her warrior knights in the headquarters shed she did not know, nor wished to. But it might well be the death of all of them.

The Krinpit was in the shallows now. It raised itself and splashed over the side and the coracle bobbed away as it lurched ashore. It seemed to be in bad shape. It staggered in a half circle on the shore and then fell to the ground with a painful crash as Colonel Menninger and half a dozen of her warriors formed a wary perimeter around it.

Perhaps they would kill it, she thought. Well, let them. Everyone else was standing and staring but Ana's attention wandered until one of the riflemen came running toward her. "Dimitrova, front and center!" he was calling. "It's the one that speaks Pak! Colonel wants you to come translate!"

When Ana Dimitrova was nineteen years old, precocious senior at the University of Sofia, candidate for the callosotomy that would forever under the two halves of her brain and lead to a distinguished career in translation, she had watched a film on the subject. It was not her choice. They would not accept her application without it. The first part was quite tedious, though instructive, as it described the anatomy of that senseless and defenseless kilogram of pinky-gray jelly that mediated and transformed and commanded all the senses and defenses of the body. Before her very eyes a surgeon took a human brain in his hands and peeled away tissue to expose that great suety bridge that connected the two halves and that, in her, she would ask someone to sever. There was a long explanation, quite hard to follow, of how nerves crossed so that the right half of the brain seemed to take responsibility for the left half of the body and vice versa: strange quirk of anatomy! She saw how the nerves carrying visual impressions intersected at the optic chiasma—but not completely, as though prankish evolution had tired of the joke and decided not to finish it. All that part of the film was quite hard to follow, as well as unsettling to look at. But then there were some comic parts. Each half of the brain commanded its own network of afferent and efferent nerves.

The efferent nerves, the ones that directed action, were spared in the resection, or reconnected afterward, which was why the split-brain people were able to walk without stumbling. Most of the time. The afferent nerves, the ones that accepted sensory impressions from the world, were kept apart. So each half of the brain could receive and process and store its own information, not shared with the other: That was why translation came easy.

But.

But some kinds of afferent input were not value-free. They produced glandular responses. They caused emotions. This was where the comic part came in. The film showed a woman, one of the earliest volunteers for the surgery. She had an earplug in one ear and was reading from a prepared text. The voice-over narration described what she was doing: delivering a translated talk to a mathematical congress. But while one half of her brain was reading and translating and speaking, the other half was listening to the words coming in over the earplug; and those words were the filthiest of scatological jokes. The woman began to stammer and falter, and over her face spread the rosiest of blushes, though the operating half of her brain had not an idea in the world of why. Blushes. Stammers. Headaches. Depression. They were the symptoms of leakage from one half to the other. The scar tissue that blocked the flow of impulses through the corpus callosum let each half of the brain work efficiently on its own. But feelings seeped through. All the time Ana Dimitrova was translating for Colonel Menninger, she could feel them pounding at her—

"He says that, as the People's Republics are no longer a force, he wishes to help us against the Fuel Bloc."

"Fucking great. What's he going to do, scratch them to death with his sharp little feet?"

—and the headache was the worst she had ever had, sickening, sandbag blows at the base of her skull. She felt nauseated and was not helped by the Kripnit. Sharn-igon was repulsively ill. Even the dull, recurrent rasp of his name—Sharn-igon, Sharn-igon—was badly played, like a defective radio. His carapace was a sickly yellow instead of the rich mahogany it had been. It was cracked and seamed. At the edges of it, where undershell joined the massive armor of the top, seams did not quite join and a thin, foul liquid oozed out.

"He has moulted," she explained to the colonel, "and feels he is about to moult again. Perhaps it is because of the chemicals the Fuel people used against them."

"You don't look so fucking great yourself, Dimitrova."

"I am quite capable of continuing, Colonel Menninger."

All the same, she moved away from the Kripnit. The exudations of his shell had darkened the sand around him and the smell was like rancid fat. Moving did not help. The headache, and the pain behind it grew with every moment.

Marge Menninger ran her hands through her wet hair, pulling it back so that her ears were exposed. She looked almost like a little girl as she said, "What do you think, Guy? Have we got ourselves a real blood-hungry tiger?"

Colonel Tree said, "One does not refuse an ally, Marge. But the Greasies would eat these jokers up."

"So what is he saying exactly, Dimitrova? That he'll tell all his crawly friends to attack the Greasy camp if we want them to?"

"Something like that, yes. What he says," she added, "is not always easy to understand, Colonel Menninger. He speaks a little Urdu, but not much, and he speaks it *very* badly. Besides, his mind wanders. It is a personal matter, with him, to kill. He does not care who. Sometimes he says he wants to kill me."

Menninger looked appraisingly at the Kripnit. "I don't think he's in shape to do much killing."

"Must one be well for that?" Ana flared. "I am sick in my heart from talk of killing, and from killing itself. It is a wicked insanity to kill when so few persons are still alive."

"As to that," said Marge mildly, raising her hand to stop

Guy Tree from exploding, "we'll talk another time. You look like shit, Dimitrova. Go get some sleep."

"Thank you, Colonel Menninger," Ana said stiffly, hating her, perhaps hating even more the look of compassion in Margie's eyes. How dare the bloody trollop feel pity!

Ana stalked off to her tent. It was raining hard again and lightning lashed over the water. She hardly felt it. At every step the throbbing in her head punished her, and she knew that behind the headache a greater pain was scratching to come out. Pity was the solvent that would melt the dam and let it through, and she wanted to be by herself when that happened. She stooped into the tent without a word to the woman who shared it with her, removed only her shoes and slacks and buried herself under the covers.

Almost at once she began to weep.

Ana made no sound, did not shake, did not thrash about. It was only the ragged unevenness of her breathing that made the black girl in the other cot rise up on one elbow to look toward her; but Ana did not speak, and after a moment her roommate went back to sleep. Ana did not. Not for an hour and more. She wept silently for a long time, helpless to contain the pain any longer. Hopes gone, pleasures denied, dreams melted away. She had held off accepting the thing that the Kripnit had said almost in his first sentence, and now it could not be denied any longer. There was no longer a reason for her to be on Jem. There was hardly even a reason to live. Ahmed was dead.

She woke to the incongruous sound of dance music.

The storm of the silent weeping had cleared her mind, and the deep and dreamless sleep that followed had begun the healing. Ana was quite composed as she bathed sparingly in the shower at the end of the tent line, brushed her hair dry and dressed. The music was, of course, that other of Marge Menninger's eccentricities, the Saturday night dance. How very strange she was! But her strangeness was not at all unwelcome. One of the fruits of it had been the patterns and fabric that had come in the last ship, and so Ana chose to put on a simple blouse and skirt, not elaborate but not purely utilitarian either. She was a very long way from dancing. But she would not spoil the pleasure of those who enjoyed it.

She cut past the generator, where the Kripnit was rumbling hollowly as it scratched through the clumps of burnable vegetation for something to eat, a guard with a GORR trailing its every step, and visited the fringe of the dance area long enough to get something to eat from the buffet. (Of course, she had slept through two meals.) When men asked her to dance, she smiled and thanked them as she shook her head. The rain had stopped and sullen Kung glowed redly overhead. She took a plate of cheese and biscuits and slipped away. Not that there was far to go. No one walked in the woods any more these days. They lived and ate and slept in a space one could run across in three minutes. But all who could be there were at the dance, and down by the beach were only the perimeter guards. She sat down with her back against one of the machine-gun turrets and finished her meal. Then she put her plate down beside her, pulled her knees up to her chin and sat staring at the purple-red waves.

Ahmed was dead.

It was not much comfort to tell herself that her dreams had been foolish to begin with, that Ahmed had never taken her as seriously as she had taken him. Nevertheless, it was true, and Ana Dimitrova was a practical person. She had learned the trick of dissecting pain into its parts. That she would never see him again, touch his strong and supple body, lie beside him while he slept—that was purest pain, and there was no help for it. But that she would never marry him and bear his children and grow old by his side—that was only a spoiled fantasy. It had never been real. That loss could not hurt her now because it was of something she had never owned; and so her pain was diminished by half.



(But, oh, how that half still ached!)

She went gently and openly for a moment and then sighed and rubbed the tears away. What she had lost, she told herself, she had lost long ago from the moment Ahmed came to Jem he had become a different person.

In any event, it was over. She had a life to make for herself, and the materials to make it from were all in this camp, there was nothing else anywhere. You should dance, she scolded herself. You should go up where they are laughing and singing and drinking.

Plainly and simply, she did not want to. It was not merely that she didn't want to dance, not yet. It was deeper and more damaging than that. Ana, translating for the Kripnit, had heard enough of what was going on in the minds of Marge Menninger and Nguyen Tree and the other hawks who directed the fate of the camp. So much madness in so few minds! They were determined to carry on a war, even here, even after Earth itself had already blown itself into misery! And yet here they all were, smiling and bobbing around the floor. Her own brain had been divided by a surgeon's knife. What had divided theirs so that they could plot genocide in an afternoon and drink and cavort and play their sexual games at night? How Ahmed would scowl at them!

But Ahmed was dead.

She took a deep breath and decided not to cry again.

She stood up and stretched her cramped limbs. The Kripnit was lurching slowly down toward the water for a drink after its unappetizing meal, the soldier wandering after. She did not particularly want to be near it but she needed to rinse her plate, either that or carry it back to the cook tent, which was too near the dance floor. She kept her distance, paralleling its scuttling path, and then she heard someone call her name.

It was the Russian pilot, Kappelyushnikov, sitting cross-legged at a gun-pit and talking to Danny Dalehouse, on duty inside it. Why not? Ana changed course to approach them and wished them a good evening.

"Is it truly good, Anyushka? But Danny Dalehouse has told me of the death of Ahmed Dulla. I am deeply sympathetic for you."

There it was, the first time someone had spoken of it to her. She discovered it was not impossible for her to respond. "Thank you, Visha," she said steadily. "What, have you become a monk that you do not dance tonight?"

"Is no one I care to dance with," he said gloomily. "Also have been having most interesting discussion with Danny on the subject of slavery."

"And what have you concluded, then, Danny?" she asked brightly. "Are we all slaves to your mistress, the beautiful blond colonel?"

He did not answer directly but chose to be placating. "I know you're upset, Ana. I'm sorry, too."

"Upset?" She nodded judiciously, looking down into the pit at him. "Yes, perhaps. I must assume that my home has been destroyed—yours, too, I suppose. But you are braver than I. I am not brave; I become upset. It upsets me that what has happened on Earth is now to happen again, here. It upsets me that my—that my friend is dead. It upsets me that the colonel intends to kill a great many more persons. Can you imagine? She proposes to tunnel under the Fuel camp and explode a nuclear bomb, and that upsets me."

Why are you doing this, she asked herself; but she knew she could not accept more sympathy without crying and she was not ready to cry before these men. At least she had diverted them. Dalehouse was frowning.

"We don't have any nuclear weapons," he objected.

"Soft-headed person!" she scoffed. "Your mistress has what she wants to have. I should not be astonished if she had a fleet of submarines or a division of tanks. She wears weapons as she wears that cheap perfume, the smell of them is always around her."

"No," he said doggedly, peering up at her, "you're wrong

about the nuclear weapons. She couldn't conceal that from us. And she's not my mistress."

"Do not flatter yourself that I care. She may have her sexual excesses with whomever she likes, and so may you."

Kappelyushnikov coughed. "I think," he said, "dance has suddenly become more attractive."

As he stood up, Ana put her hand on his arm. "I am driving you away. Please forgive me."

"No, no, Anyushka. Are difficult times for all, nothing to forgive." He patted her hand, then grinned and kissed it. "As to myself," he said, "I see beautiful blonde colonel roaming about alone and perhaps she wishes to dance or otherwise relate to some new person, such as I. Also do not care for cheap perfume worn by big cockroach. You do not yourself desire to dance? Or otherwise relate? No. Then stay with friend Danny."

They watched him walk steadily toward Marge Menninger, strolling past her checkpoints. They heard her laugh as Cappy spoke to her; then he shrugged and moved on toward the dance floor.

The Kripnit, in its random stagger around the beach, was coming closer. It was true that the stench of his exudations was strong. So was the sighing, droning sound of his presence. Ana listened, then said gloomily, "This one is muttering about his love now. It was killed somehow. I cannot tell how. I think Ahmed had something to do with it and it is for that that it is determined to kill human beings. But it had become Ahmed's ally! Dan, is not that lunacy? It is as though killing has become an end in itself. It no longer matters who is killed or for what possible gain the killing is done. Only the killing itself matters."

Dalehouse stood up in his shallow rifle pit, looking up the hill toward the dancers. "She's coming this way," he said. "Listen, before she gets here. About her being my mistress—"

"Please, Danny. I spoke without thinking and because I am, yes, upset. It is not a time to worry about personal matters."

Clearly he was not satisfied and would have pursued the subject, but Margie was now too close. She paused to light a cigarette, studying the Kripnit and its guard, now a model of military department, his recoilless at port-arms, as the colonel approached. Then she came smiling over to Danny and Nan. "Getting it on, are you?" she asked amiably. "When was the last time you checked your earphones, Danny?"

Guiltily, Dalehouse clipped the phone to one ear. He had been neglecting the buried microphone probes, which were supposed to warn of burrowers digging toward him under the ground. There was no sound. "Sorry, Margie," he said.

She shook her head. "When you're on duty, that's 'colonel.' And when I say 'frog,' you hop. Now that that's understood," she said, smiling sunnily, "would either of you folks like a hit before we talk some business?"

"I am not in the habit of using narcotics," Ana said.

"Pity, Danny?" She watched while Dalehouse filled his lungs and, as she took the stick back from him, she said, "I want you to draft your gasbag friend. One hundred and—" she glanced at her wristwatch—"one hundred and eight hours from now, give or take a little, we're going to hit the Greasy camp, and he's going to be our air arm."

Dalehouse coughed and spluttered. "He—he can't—"

"Take your time, Danny," she encouraged. "While you're getting your breath, just listen for a moment. Storm's over. Looks like we've got maybe five or six good days. I'm taking fifteen front-line effectives, plus you, Danny. We'll mop up that camp without breathing hard. Only I don't want to take a plane, and I don't want you or Cappy floating around up there where they can see you, and that leaves Charlie."

"Charlie can't fight!"

"Well," she said reasonably, "come to that, I don't figure you for your real Geronimo trained killer either. But I don't expect it of you. You communicate. Charlie observes. The Greasies won't pay any attention to one more fartbag hanging around—"

"Bullshit they won't! They've been shooting balloonists down all along."

"Danny," she said, "I'm not asking your advice. I'm giving you an order." She dragged on the joint, down to the last centimeter, and then carefully rubbed it out and pocketed it before exhaling. "You see," she said, "the Greasies are going to come to the same conclusions I did, only it'll take them a little longer. One of us has to run things. The only way to do that is to knock the other out. All Charlie has to do is hang in there with his radio and keep us posted if they send up a plane or put some people out in the woods. I'll bring the company up over land. But we're naked without air cover. We need to know when to get out of sight. That's easy enough for him, right?"

"Well, sure. But—shit, Margie. He's almost the last survivor. It's a lot to ask—"

"But I'm not asking, Danny, you keep making that same mistake. I'm ordering. If he doesn't, he'll make a nice flame." She scratched under her belt, regarding him amiably. "So after the dance I break the news to camp, and tomorrow this time we're on our way."

"To atom-bomb the Fuel Bloc," said Ana bitterly.

Marge Menninger's face froze. After a moment she said, "I guess I'll let that pass, Dimitrova. I didn't specifically order you to keep your mouth shut. But I won't let it pass again. What you hear when you're translating is *classified*."

"Holy Christ," Dalehouse said. "You really have a nuclear bomb?"

"Bet your ass, Danny. You've got a piece of it right there in your ground mikes."

"Where? You mean the plutonium power-packs? That's no good, Margie—Colonel, I mean. There's not enough of them. Even if there were, you couldn't flange them together to make a bomb."

"Wrong and wrong, Danny. Takes eighteen hundred grams and a bit to fission. I have a little over six thousand grams, all tidied away in the stores marked 'fuel replacements.' All this was planned a long time ago, and they'll fit together because some pretty high-powered weapons people designed them to do that before the first ship took off. Oh, it's not one of your hundred-megaton jobs. Maybe not even a kiloton because I don't have containment to keep the parts together very long. But I don't want a big one. I don't want to wipe out the Greasy camp, I want to own it. I want to take out their ammunition and their food stores, and I know just the place to put baby for that. Then they can beg."

She looked serene and innocent as she said it, and Dalehouse responded with shocked disbelief. "That's—that's unprovoked aggression! A stab in the back!"

"Wrong, Dalehouse. That's preemption. The Greasies don't have a choice, either. They just haven't figured it out yet."

"Bullshit! It's what the Japanese did at Pearl Harbor all over again!"

She opened her eyes wide. "Sure, why not? There was nothing wrong with Pearl Harbor, except they fucked it up. If they'd gone on to take out the carrier fleet and followed up with a landing, history would be a lot different. You'd be saying 'Pearl Harbor' the way you say 'Normandy' now, only you'd be saying it in Japanese."

She seemed quite pleased with herself, but then she hesitated. She sought a dry place on the ground and sat down before adding, "But I will admit to you two dear old friends from Bulgaria that right now I'm scared, and tired, and not what you'd call real happy with the way things are going. I'm—what's the matter with that thing?"

The Krintip was staggering closer to them, moaning and stridulating. Ana listened. "He is quite hard to follow. He is speaking of Poison Ghosts and Ghosts Above—that is, of ourselves and of balloonists. He seems to have us confused in his mind."

"All enemies look alike after a while, I guess. Tell him to back away. I don't like the way he smells."

"Yes, Colonel Menninger." but before Ana could summon up the commands in Krintip-Urdu, Margie stopped her again.

"Wait a minute. What was that?" There had been a voice on the P.A. system, along with the blare of dance music.

"I couldn't make it out," said Dalehouse, "but I do hear something. Out in the woods. Or in the air—"

Then the dance music abruptly died and a scared voice replaced it. "Colonel Menninger! All personnel! Aircraft approaching!"

The sounds were clear now, two sets of them: the whickering putt-putt of a helicopter and a quicker, higher sound. The dancers scattered.

Over the trees two shapes appeared. Neither was moving very fast, but they came without warning: the Fuel helicopter and a stub-winged STOL plane, one they had not seen in the air before. They did not come in peace. Soldiers strapped to the pods of the helicopter were firing incendiary rockets, while wing-mounted machine guns on the STOL strafed the camp. The fixed-wing plane made a roaring run that took it out over the water, then rose, turned and dived in again. On its second pass the guns did not fire, but four tiny rockets leaped out from under the wing and streaked down into the stores shed and set fire to a row of tents.

The Greasies had not been so slow after all.

Here and there around the camp, and inside it, perimeter guards and the more quick-witted of the dancers were beginning to return the fire. Margie jumped to her feet and began to run toward the nearest rocket launcher, and then the stub-winged plane on its third pass swerved toward her. It was using both machine guns and a flame thrower now. As the bullets stitched toward her, Margie dodged and fell, almost beside the Krintip; and the creature rose up high above her. It launched itself, two hundred kilograms of half-moulded body, on top of Marge Menninger.

**S**HARN-IGON KNEW THAT this would be his last moul, terribly premature, agonizing, fruitless. He would never experience the satisfying itch of his new carapace as it hardened and stretched over the soft inner pulp, never feel the sexual stirring of the newly shelled and embark on the quick contest of a female with a he-mate. As the Poison Ghosts Above had zoomed in toward the camp, he had tried to warn these new allies. But they were deaf to the brilliant sounds from over the trees, deaf to his warnings.

The pain was too much.

It had been his intention to assist them in killing each other to the maximum extent possible, and then himself to kill the survivors. But perhaps he had done all of the assisting he would ever do. The agony of his new shell, already beginning to crack again, tormented his thoughts. The blinding sounds of the aircraft and the explosions dazed him.

There was only one Poison Ghost left that he could kill. It would have to be enough. He raised himself on his painfully soft-shelled limbs, leaned forward and crashed down on top of her just as the soft, deadly tongue of the flame thrower licked at them both.

By then the whole camp was firing at the aircraft, or that much of it that was still able to fire. But the planes were out of reach. They hung out over the water, a kilometer and more away, the helicopter dancing lightly, the STOL turning in small circles, and did not return to the attack.

The next assault came from another place.

A scream from one of the machine gun pits, and the two soldiers in it were down, ripped to shreds, and out of the pit came a long, limber black shape wearing tiny goggles and racing its dozen limbs to the nearest knot of humans; and another behind him, and another.

The burrowers managed to kill more than ten of the survivors. But that was all. Even with the sun-glasses they were no match for trained human soldiers on the surface of the



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planet. If the planes had continued their attack—but they didn't. The human defenders quickly rallied and at the end there were fifty burrowers stretched out on the ground, soiling the sand with their watery black blood. No more came because there were no more in the nest to come. That burrow had been wiped out.

Dan Dalehouse stood peering out over the sea while one of Cheechee Arkashvili's assistants bandaged a deep gash in his arm. The planes were gone. In the middle of everything, they had quietly flown down the coastline and away. "And why didn't they finish us off?" he asked. There was no answer.

## XXI

**B**Y THE TIME THEY FOUND Margie Menninger still alive, the fight was long over, and the camp was almost functioning again.

She had lain under the dead and stinking Kripnit for more than two hours, stunned, half suffocated, unable to shift the gross dead weight on top of her, her limbs twisted painfully but unhurt. Like the djinn in the bottle, at first she would have given a king's ransom to her rescuer. When they

finally heard her sand-gagged attempts at a bellow and dug her out, what she wanted to give was death.

They helped her a few steps away, with their heads averted from the stink. She gagged and swore at them and when they tried to help her to stand she collapsed and vomited into the sand again. The doctor came running, but a doctor wasn't what Marge needed. What she needed was to get the cesspool stench of the Krimpit off her and out of her nostrils. She let Cheechee strip off her coveralls and assist her to the edge of the water and then she splashed around until the smell was gone and she could walk again. Limping, yes. But under her own power. Wearing a bra and bikini panties, with her gumbel over her shoulder, she walked up the shore past the dead Krimpit, seared into a sort of omelette of meat and shell, until someone came up with a terrycloth robe, giving orders as she walked.

Why had they stopped?

The camp had been at their mercy. With great precision they had knocked out the heavy weapons on the first pass. There was not a rocket launcher or a machine gun untouched, nothing but hand weapons. Of the hundred and eight persons in the food camp, twenty-two were dead, nearly fifty were wounded or burned. The planes had been unscathed. The burrowers had been wiped out entirely, but if the planes had finished their work first, the burrowers would have had an easy time with the survivors. Why? The timing had been exact. As soon as the planes stopped shooting, the burrowers came out. That could not have been a coincidence, and the goggles the burrowers wore were proof that the Greasies had prepared them for the job. But then they hadn't followed through.

Why not?

But thank God for Poppa and his parting gift! A metric tonne of ammunition had been blown up but there were metric tonnes left untouched by virtue of the spare supplies in the final ship. Tents were burned and food destroyed. But there was more. If Cappy's airplane had been stitched across by machine gun fire, there were spare parts to fix it. And that greatest of gifts, the six kilograms of Pu 235 in its carefully crafted sheaths, that was still intact. The deaths were irreplaceable, of course. Worse still were the casualties because some of them were not merely a loss but a debit: Nguyen Dao Tree, who had lost a leg and a lot of blood to go with it; six persons badly burned, two others with serious abdominal wounds—a whole cluster of damages for Cheechee Arkashvili to try to repair. For each one of the worst off, there was the cost of an able-bodied person to tend him. There was no tent still standing big enough to hold them all, and so Cheechee had put them onto cots dragged out of the damaged tents, out in the open; some of the bedding was scorched, and if it began to rain again they would be in trouble. But for now they were as well off as they were likely to be, Marge thought as she moved among them.

One of them got up as Marge approached: Lieutenant Kristianides, one whole side of her body in gauze and anti-burn dressing, but functioning. "Colonel," she said, "I had to leave the radio—"

Marge glanced at the doctor, who shook her head. "Get back in bed, Kris. Tell me about it later."

"No, I'm all right. When they shot the tent up I ran out. But I left the tape going. I was getting their chatter, only it was in all different languages."

"Thanks. Now get back in bed," Marge ordered and looked around. "Dalehouse, front and center!" she called. "Check the radio shack. If the tape's still working, give me a yell."

He didn't look too good himself, she thought, as he put down the tray of dressings and headed up the hill without a word, but none of them did. Especially herself. Marge's own tent had been one of the totaled, and what she was wearing was fatigues belonging to a woman who would never again need them—not unfair, but she had been a taller and fatter woman than Marge Menninger.

When Dalehouse called her, she had forgotten about the

tapes. But she went up to the shack, unburned and not really harmed except for bullet-holes, commandeering Ana Dimitrova on the way. The tape was voice-actuated and Dalehouse had already found the right place to begin. Ana put on the earphones and began to translate.

"First one of the pilots says, 'On target,' and the base acknowledges. Then there are some carrier noises as though they were going to transmit and changed their minds, and then the base says, 'Suspend operations at once. Do not attack.' And one of the pilots, I think it is the Egyptian, says in a different Arab dialect, 'Strike already in progress. We have taken out their weapon dump. Body count around twenty-five.' Then there is some mumbling that I cannot make out, as though they are talking at the base with the transmitter on but not close enough to pick it up. And then the base says, 'Urgent. Suspend operations immediately.' And then the other pilot, the Irishman, says they are observing from over the water, waiting for instructions, and then the base orders them to return without further attack. That is all there is on the tape until they get landing instructions later on."

"That's it?" Marge asked.

"As I have said, Colonel, yes. There is nothing else."

"Now why would they change their minds in the middle?" Marge asked. Neither Dalehouse nor Dimitrova offered an answer. She hadn't expected one. It didn't matter. The Greasies had declared war and if they backed out in the middle of it, that was their problem, not hers. She would not back out. To Marge Menninger the attack on her base—her base!—answered all questions right there. "Why" didn't really matter. The only question was how—how to carry the fight to them, and win it.

"Can you dig with that shoulder?" she asked Dalehouse.

"I guess so. It's not bleeding."

"Then go help Kappelyushnikov dig graves, Dimitrova, you're a radio operator now. No transmissions. Just listen. If the Greasies say anything, I want to hear about it right away."

She left them and headed for the surviving latrine. She didn't particularly need to go to the bathroom, she just wanted to be alone for a moment to clarify her thoughts. She ranked her way to the head of the line, closed the door and sat there, smoking a cigarette and staring into space.

There was no question in her mind that she could win this war, because she had some powerful cards to play. The plutonium store was one of them. The other was Major Vandermeer's little dispatch case. There were still four birds in orbit and one could hit the Greasy main camp and the other their Farside base any time she gave the order and that would be that.

The trouble was, she didn't want to destroy the Greasy facilities. She wanted to acquire them. The birds and the bomb were overkill, like trying to take care of a mosquito with a mortar. In the first fury after the attack, if she had had that button handy to push she would have pushed it; but, by the time they dug her out from under the Krimpit, she had decided to wait.

No. It would have to be a straight overland operation. Maybe the plutonium, if it could be placed exactly right. Not the missiles. It was a pity the Greasies had launched their preemptive strike before she was quite ready to launch hers. But not a disaster. The worst thing about the raid was that her cadre of effectives had been seriously reduced. How was she going to mount her retaliatory strike without grunts?

Marge Menninger had just taken the one decision that gave the human race a future on Jem, even though she didn't know it.

THE ONLY GOOD THING about all this," Dalehouse said to Kappelyushnikov, "is that most of the casualties were military. At least now we can get on with the real business of the expedition."

Kappelyushnikov grunted and threw a few more spadefuls of

dirt before he answered. "Of course, is so," he said, pausing and wiping sweat off his face. "Only one question. What is real business of expedition?"

"To survive! And to preserve. God knows what's happening on Earth. We may be all that's left of the human race, and if anything's going to be left of, what, maybe five thousand years of science and literature and music and art, it's here."

"Very discouraging amount of responsibility for two grave-diggers," Kappelyushnikov commented.

"You are of course right, Danny. We have saying in Soviet Union, 'Longest journey begins with single step.' What step do we take now?"

"Well—"

"No, wait, was rhetorical question. First step is apparent. Have finished covering up graves of now-absent friends, so you, Danny, please step up to colonel's headquarters and report burial services can begin."

He jammed his spade into the dirt and sat down, looking more despondent than Dalehouse had ever seen him.

Dalehouse said, "All right. We're all pretty tired and shook up, I guess."

The pilot shook his head, then looked up and grinned. "Am not only tired, dear Danny, am also very Russian. Heavy load to carry. We have other saying in Soviet Union, 'In thousand years, what difference will it make?' But now I tell you the truth, Danny. All sayings are bullshit. I know what we do, you and I and all of us. We do the best we can. Is not much, but is all there is."

Dalehouse laid down his spade and trudged up the hill to the headquarters shack, thinking hard. A heavy responsibility! When you looked at it carefully, there was no way to preserve everything; so much that was irreplaceable would inevitably be lost. Probably already was lost: There was not much chance that the Arc de Triomphe and the British Museum and the Parthenon all survived, not to mention some billions of fairly irreplaceable human beings. It was hard for Danny to accept that he would never again see a ballet or listen to a concert. Or fly in a clamjet or drink in a revolving restaurant on top of a skyscraper. So much was gone forever! And so much more would inevitably vanish as they tried to rebuild...

Yet there was one great asset not yet destroyed: hope. They could survive. They could rebuild. They could even rebuild in a better way, learning from the mistakes of the past, on this virgin planet—

There was a knot of people gathering around the headquarters shack, and Marge Menninger, with a couple of her aides, was trotting up to join them. Dalehouse hurried his pace and arrived in time to hear Ana saying, "This message just came in. Colonel Menninger. I will play the tape for you."

"Do it," snapped Marge, out of breath and exhausted. Dalehouse moved closer to her. She seemed near to collapse. But as the tape player hummed and scratched, she pulled herself together and stood listening intently.

Danny recognized the voice. It was the black Air Vice Marshal, Pontefract; and what he said did not take very long. "This is an official message on behalf of the Fuel Exporting Powers to the Food camp. We offer an immediate and permanent armistice. We propose that you remain within twenty kilometers of your camp, in the direction toward ours, and we will observe the same limits from ours. We request an answer within one hour."

There was a pause, as though he were shuffling papers in his hand, and then the rich Jamaican tones began again:

"As you are aware, our airstrike against your camp was provoked by your destruction of our satellites. It was ordered only after full exploration of all alternatives. Our intention was to wipe your base out completely. However, as you are also aware, we terminated the strike after inflicting relatively minor damage on your base. The reason for this decision is the reason for this offer of armistice now.

"Our star, Kung, is unstable. It is about to flare.

"We have been aware for some time that its radiation level has been fluctuating. Within the past twenty-four hours it has become more extreme. While the air strike was in progress, we received information from our astrophysicists that a major flare will occur in the near future. We do not have an exact time. Our understanding is that it may occur as early as forty-eight hours from now and almost surely within the next two weeks. If you accept our offer of armistice, we will transmit all technical data at once and your people can make their own judgments."

The voice hesitated, then resumed in a less formal way. "We have no knowledge of conditions on Earth at present, and suppose you have none as well. But it is clear that, for all practical purposes, we on Jem are alone in the universe at this time. We think we will need all the resources we have to prepare our camp for this flare. If we continue to fight, we suppose we will all die. I do not propose that we work together. But I propose that we stop fighting, at least until this crisis is past." Another pause. Then: "Please respond within an hour. God help us all."

Margie closed her eyes for a moment while everyone waited. Then she opened them and said, "Call them back, Dimitrova. Tell them we accept their offer, ask for their technical data at once and say we will be in contact again when we have something to say. Folks, the war is over."

Ten minutes later the whole camp knew it. Margie had gone on the public-address system, played the tape from Marshal Pontefract and broken the news of the disaster and the truce. She had called a general meeting for oh three hundred hours, about ninety minutes from then, and ordered Alexis Harcourt, the nearest thing they had left to an astronomer, to go over the data from the Greasies and report before that time. Then she turned to Danny Dalehouse and said, "I don't have a bed anymore but I need about an hour's sleep real bad."

"There's a spare in my tent."

"I was hoping you'd ask." She peered up toward the sullen glow in the clouds where Kung was hiding and shook her head. "It's been a son of a bitch of a day," she said as they picked their way toward a tent row. "And it's not over yet. Know what I'm going to do at the meeting?"

"Am I supposed to guess?"

"No way, Danny. You'd never make it. I'm going to announce the impending retirement of Colonel Marjorie Menninger from active service."

"What?"

"Pick your teeth up, Danny, and don't just stand there," she advised, tugging him along. "We're going to convert this place to civilian government, effective as soon as the emergency is over. Or maybe before. I don't care. Maybe all you guys that're bitching about the Army way of doing things are right. I have to say that my way hasn't been working out too well, everything considered. So I think we're going to need elections for a new government, and if you want my advice, you'll run."

"For what? Why Me? Margie, you get me all mixed up!"

"Why you? Because you're practically the only original settler left, you know that? Just you and Cappy. Because nobody hates your guts. Because you're the only person in the camp with the age and experience to handle the job of running things and who isn't a soldier. Don't let me pressure you, it's your decision. But you've got my vote. If," she added in a different tone, "anything we decided makes any difference at all now."

They were at his tent and Marge paused at the flap, staring up at the sky. "Oh, shit," she said. "It's beginning to rain."

It was, big drops, with promise of more behind them. "The casualties!" he said.



"Yeah. We're going to have to get them under cover. And that's a pity, Danny, because I was kind of hoping we could catch us a little R&R before the meeting."

In spite of everything, Danny could not help himself. He laughed out loud. "Marjorie Menninger, you are some kind of strange. Get in there and get some sleep." But before she turned, he put his arms around her for a moment. "I never would have thought it of you," he said. "What converted you to civilian values?"

"Who's converted?" Then she said, "Well, maybe it was that fucking Kripnit. If it hadn't been for him, you'd have been burying me a little while ago, too. I didn't trust him either, but he gave his silly life to save me."

WITH SO FEW OF THEM left, they didn't really need the P.A. system to cope with fifty-five or sixty persons listening, but they hooked in one speaker for the benefit of the casualties who were well enough to hear, in their tents down the hill. The rest sat or stood on the wet planks of the dance floor, in the sullen, steady rain, while Marge Menninger spoke to them from the little dais. She turned the stage over to Harcourt.

He said, "A lot of the data from the Greasies isn't astronomy, it's geology. They've done a lot of digging. They say there seem to be flare episodes every twenty or thirty years. There's no set pattern, but by the amount of ash and char they think your average flare involves about a seventy-five per cent increase in radiation averaged out over a period of a week or more. That's enough to kill us. Partly heat. Mostly ionizing radiation."

"Now, when does it happen? Their best guess is ten days—give or take ten days." There was a murmur from the audience and he nodded. "Sorry about that, but I don't have the training to make it any closer than they do. In fact, I'm only taking their word. The picture I get is of slowly increasing heat over a period of a couple of weeks. I think we've been having that, and maybe it's why the weather has been so lousy. Then the flare. Surface temperature goes up to maybe three-fifty degrees. That's absolute—say, somewhere between where we are now and the boiling point of water. I don't think it goes over that, not for very long, anyway. But there are peak flares and they're like striking a match. If anything can burn, it will. Apparently the forests burn but maybe not right away—they'd probably have to dry out first. Then the flare recedes, temperature comes down, the air drops our moisture and you get rain to put out the fires. Probably a hell of a lot of rain, over a period of weeks or months. Then you're back to normal."

"Only dead," somebody called out from the audience. Harcourt spread his hands defensively.

"Maybe not. If you're in shelter, you might survive." He started to continue, then stopped himself. Margie came up beside him.

"You don't sound too confident."

"I'm not. The—ah, the geological record doesn't inspire much confidence. The Greasies took cores from more than a hundred different sites and they all showed the same pattern, recurring char and soil, back up for thousands of years."

Dalehouse stood up. "Alex," he called, "why hasn't it killed off everything on the surface of Jem long ago?"

"You're asking for a guess? I guess it has. At least all the vegetation. It burns off, then regrows from roots, most likely. Seeds probably would survive, though. And those drenching rains after each flare would give the new growth a good start in fertile soil—the char's great fertilizer; primitive man used to slash and burn to get his farms started, back on Earth. I don't know about the animals. I'd guess the Creepies would be all right in their tunnels, if they didn't starve to death waiting for new growth to live on. Probably a lot of them do. Maybe the

same for the Kripnit, because it would take a lot to kill them off. They don't have to worry about being blinded by the radiation because they don't have any eyes to begin with. And those shells are pretty good armor for their vital organs. Probably get a lot of mutations, but in the long run that's as much good as it is bad for the race."

"What about Charlie?"

"I don't know. That's harder. I guess a really good flare might wipe out damn near all the adults. But that's when they spawn, and the spawn might survive. Also, no doubt, with a lot of mutations. I'd say evolution moves pretty fast here."

"Well, look," Margie cut in. "If all these things can survive, why can't we?"

Harcourt shrugged. "They're adapted, we're not. Besides, I'm talking about *races* surviving, not individuals. Maybe as few as one per cent live through it. Maybe less." He looked around the audience. "One per cent of us leaves how many?" he asked.

"Yeah," Margie said slowly. "Well, I think we get the picture. We need to get under something big enough to stop both heat and radiation, and we need to do it in a hurry. Got any ideas on what we can make a roof out of?"

Harcourt hesitated. "Not a clue," he confessed. "Certainly the tents won't do it. Oh, and I should mention the winds. They probably get pretty fierce, with all that isolation. So anything we did build would have to stand up to maybe two hundred k.p.h. hurricanes. Maybe more. I, uh, I thought for a minute of using the Creepies' tunnels, and that might work. For some of us, anyway. But I doubt that more than ten per cent of us would live through maybe two or three weeks underground, without very good ventilation and certainly no air conditioning—and that air down there is going to get *hot*."

There was a silence while everyone considered possibilities. Then Kappelyushnikov came forward. "Is one thing we can do," he announced. "Not many of us. Maybe fifteen, twenty. Can get in return capsule and go into orbit."

"It's just as hot there," Marge Menninger protested.

Cappy shook his head. "Is only radiation. Steel hull reflects ninety-nine per cent maybe. Anyway, plenty. Only problem—who decides which twenty lucky people go up?"

Marge Menninger thought for a moment, then said, "No, that's a last-ditch, Cappy. There's another problem with it: What do all those lucky fellows do when they come down again? There aren't enough of us left now. I don't think twenty would be enough to survive. If we went up—strike that; I'm not saying I would be one of the 'we.' If anyone went up, it'd be just as smart to keep on going. Try to get back to Earth. Maybe go to one of the other colonies. The chances would be as good as coming back here, when the whole planet's fried."

Harcourt nodded but then corrected automatically, "Not the whole planet."

"What?"

"Well, only half the planet. Our half. The part that faces Kung. The far side probably wouldn't even notice there was a flare going on. That's no good for us," he went on quickly, "because we can't live there; we don't have time to build an airtight, heated dome and move everything—what's the matter?"

Margie had burst out laughing. "Son of a bitch," she said. "Shows how wrong you can be when you start trying to trust people. Those bastard Greasies aren't giving us a square count! They didn't stop fighting because they wanted to make peace. They stopped because we were as good as dead anyway!"

"But—but so are they—"

"Wrong! Because they have a *Farside* base!" She shook her head ruefully. "Folks," she said, "I was going to make a real magnanimous announcement about turning the reins over to civilian government, only now I think that's going to have to wait. We've got a military job to do first. When this side of the planet goes, they've got that snug little nest on the

side that never gets radiation from Kung anyway, and they couldn't care less if the son of a bitch blows up. That's going to be a nice place to be. And we're going to take it away from them."

## XXII

THESE WERE THE MESAS and canyons of the high desert. Danny Dalehouse had flown over them in less than an hour and seen them only as quaint patterns in an unimportant carpet beneath. Marching over them was something else. Kappelyushnikov ferried them in as close as he dared, three at a time, once four, with the little biplane desperately slow to wallow off the ground. He made more than a dozen round trips and saved them a hundred kilometers of cutting through jungle. Even so, it was a three-day march and every step hard work.

Nevertheless, Dalehouse had not felt as well in weeks. In spite of bone-bruising fatigue. In spite of the star that might explode at any moment. In spite of the fact that Marge Menninger's shopping list had overlooked a supply of spare hiking boots, and so he limped on a right foot that was a mass of blisters. He was not the unluckiest. Three of the effectives had been unable to go on at all. "We'll come back for you," Margie had promised; but Dalehouse thought she lied, and he could see it in the eyes of the casualties that they were certain of it.

And still he would have sung as he marched, if he had had breath enough for it.

It had been raining on and off for nearly forty hours. Mean, wind-driven rain that kept them sodden in the steamy heat, even when it let up, and chilled when it drenched them. That didn't matter either. It was regrettable because it meant that Charlie and the two remaining members of his flock could not keep in touch with them visually. And he had had to take the radio away from the balloonist before they left—far too easy for the Greasies to intercept. Whenever the clouds lightened, Dalehouse searched the sky for his friend. He never saw him, never heard his song, but he knew he was up there somewhere. It wasn't serious. The weather that kept Charlie from scouting danger for them kept the Greasies from providing it.

There were twelve of them still toiling toward the Greasy camp. They had left the rest of the survivors—the highly impermanent survivors if this expedition didn't do what it was supposed to—back at the base with orders to look as though they were twice as numerous as they were. Margie herself had transmitted the last message to the Greasies: "We are beginning construction of underground shelters. When the flare is over we can discuss a permanent peace. Meanwhile, if you approach, we will shoot on sight." Then she pulled the plug on the radio and crawled into Cappy's plane for the last ferry trip.

They had less than ten kilometers to go—a three-hour stroll under good conditions, but it would take them all of a day. It was scramble down one side of a ravine and crawl up the other; peer over the top of a crest and scuttle down its other face. Not just the terrain. They were all heavily loaded. Food, water, weapons, equipment. Everything they would need they had to carry on their backs.

The red cylinders marked "Fuel Elements—Replacement" were the worst. Each cylinder contained a hundred of the tiny clad needles and weighed more than a kilogram. Twelve of them made a heavy load.

At the end of the first march, Margie had gone through the party, checking loads. When she came to Ana Dimitrova, sitting hugging her knees next to Danny Dalehouse, she said softly, "Are you sterile?"

"What? Really! What a question!" But then Margie shook her head.

"Sorry, I'm just tired. I should have remembered that you

aren't." And she grinned and winked again at both Dalehouse and Ana; but when they picked up packs again Ana's load was changed to water flasks and limping old Marguerite Moseler was carrying the fuel rods.

Margie looked terrible and at every stop she seemed to look worse. Her plumpness was long gone. The bone structure of her face showed for the first time in years and her voice was a rasp. More than that, her complexion was awful. When the Kripit buried her for two hours its moulting juices overrode her defenses. A day later she had broken out in great purplish blotches, and had a skin discoloration like sunburn. She said it did not hurt; there, too, Dalehouse thought she lied.

But he thought she was telling the truth about one very important thing, and perhaps that was the reason he could not repress a feeling of cheer. The bomb they were carrying would not be used.

He had been the one to propose it and she had accepted the idea at once. "Of course," she said. "I don't want to destroy their camp. I want it, all of it—not only for us but for the future of the human race on Jem. The bomb's best use is as a threat, and that's what we'll use it for."

He said as much to Ana at their last halt before coming in sight of the Greasy base. "She's planning for future generations. At least she thinks it's worth keeping your chromosomes intact."

"Of course," said Ana, surprised. "I have that confidence too." And so, Danny Dalehouse was discovering, did he. Bad as things were, he had hope. It carried him through that last belly-crawl, three hundred meters in the drenching rain, into the muddy cave that was their point of entrance for the burrow tunnels under the Greasy base. It sustained him while Major Vandennour and Kris Kristianides painfully and gingerly assembled the parts of the detonator and fitted the fuel rods into it. It survived after Margie and Vandennour and two others wiggled their way into the abandoned courses and disappeared from sight. The part of his life, of all their lives, that they were living through was misery and fear. Maybe worse than that, it was self-reproach; they were doing something that Dalehouse could not think of as noble or even tolerable. It was a holdup. Armed robbery. No better than a mugging. But it would be over. And a better time would come! And that hope kept time going for two full hours after Margie and the others had crawled away. Until Kris Kristianides, looking scared and harried, checked her watch and said: "That's it. From now on everybody stay inside. Face the wall. Hands over your eyes. When the fireball comes, *don't look up*. Wait ten minutes at least. I've got goggles. I'll tell you when you—"

Then they drowned her out, Dalehouse first and loudest. "She's going to do it! But she promised—"

"Shit, Dalehouse, she couldn't keep that promise! The Greasies would think it was a bluff. She's going to take out their arms and food, just like we planned, and then we'll move in and wipe them up."

"What insanity!" cried Ana. "There'll be nothing there! The fallout will kill us if we go into the camp."

"Maybe. I've got a counter. We'll check everything out. The important thing's the planes. If we get them, we can get to their base on Farside." She hesitated. She had been carefully rehearsed in all this and had carried the secret with her for more than a day. But she had dreaded this moment. If it were not for her burns, she would have been in the warrens with the colonel and the major, and a lot happier there than she was here. "Anyway," she finished, "there's nothing we can do about it now. She'll blow the bomb in the next ten minutes. Get your faces down!"

And then, at last, hope was dead.

For the Brood Mother, too, all hope was gone. Blind and alone, she moved slowly down through the tunnels, to the only

place left for her to be.

The thirty-meter level was for pups and outcasts. It was a place to play growing-up games or, at the end of all games, a place to die. Mother dr'Shee had never been there before. She had been a biddable pup, trained early to responsibility. As a tiny thing she had found it tingly-thrilling to listen to the stories of the half-grown, shivering in delight as she groped for the teat in her nurse's sheltering silk. But she had never explored the adventurous levels for herself. Not once. She had known that the time would come soon enough when, at the end of her life, she would drag herself down to see those old, unvisited levels, and die.

In that she had been partly wrong. It was time to die, and she was there, but she could not see.

With dignity, the Brood Mother raised her forebody to its fullest stretch and called, "Is anyone near?"

There was no reply. No sound. No scent except the stale, spoiled smell of elders long dead. She tried again, not because she had any hope of being answered, but for the sake of being methodical: "Person or pup, can anyone hear my voice?"

Nothing. If there had been an answer, it could have been only one of the wild young males that roamed the upper corridors, seeking only to kill. But there was not even that.

So another of her senses had become useless to her. Hearing meant nothing when there was nothing to hear.

It was a pity she was blind, but she bore no malice toward the Two-Legs who had burned out her eyes with their stroboscopic lights. She had in any case revenged herself against a number of them in advance—for poisoning her tunnels, for abducting her young, for perverting the brood into new and vile practices. Most of all for coming to disturb her life in the first place. She had fought against it all, against the Two-Legs and sometimes against members of her own brood, turned against her by the new ways of the Two-Legs. And now the tunnels were empty, and she was blind. *Tssheee!* It would have been less—less *final* to be here and alone if she could have seen at least an occasional phosphorescent glimmer of fungus or decay. What was left of her senses? Taste no longer mattered. There was little to eat. Smell unrewarding, with neither males nor pups to nuzzle. She could still feel the powdery dust floor beneath her, the curving wall at her side. Dr'Shee took comfort from being tightly enclosed, as she had been through all the happiest parts of her life...

Which was now over.

She stretched and sighed a feline, purring sound of despair. She was beginning to be very hungry.

The Two-Legs had ruined most of the food stores when they poisoned the tunnels to get at her and her few surviving allies. But the tunnels stretched ten kilometers in all directions. Somewhere there would be something in this immense engineered warren that had been her world. She did not seriously think of seeking it. A Brood Mother did not debase herself to prolong a life that was over.

—woomp—

The tunnel around her moved.

It was not a shake or a tremor but a deliberate and almost peristaltic movement. Mother dr'Shee had never before experienced such a thing. Burrows sometimes crumbled, Krippli invaded them, the rains might wash through a roof. But for all the earth to move? Such a thing could not happen! For the Brood Mother such an event was exactly as disquieting as it would have been for a fish to scull its tail and yet not move, or for a human being to feel the air about him turn glassy and shatter.

And then, from thirty meters above and more than a kilometer away, she heard the sound that followed. It was more than a sound, it was a pressure in the air that stung her ears and left them filled with a distant, discordant chatter, like the peeping of a hungry litter. But there were no pups to cry for her, ever again.

FOR SOME REASON MARGIE'S right knee was only scraped and sore while the left one was bloodily gouged, the leg of the coverall worn through, the skin itself long since rubbed away. It was harder and harder for her to keep up with the two ahead of her. God had not intended her to crawl through tunnels ninety centimeters high for hours on end... whichever God she meant was not quite clear. To spare her knee she tried for a while a three-legged gait, putting a little weight on her left toes, the rest on the right leg and hands. That was a bummer. She wound up with the worst cramp she ever had in the calf of her leg. She had to stop and press it out while Vandennour, behind her, almost caught up and the two ahead kept on going. So then she speeded her pace and ripped the knee still more.

She paused and glanced at her watch. Still more than a quarter of an hour before the device would go off. Before that time the two grenades they had left at bends in the tunnels would bring down enough dirt to tamp the explosion, and they were a good kilometer away by now. Probably far enough for survival, if not comfort. "Take ten," she shouted. She rolled over and rested her limbs, breathing hard of the stale and tainted air. Funny, it was not really dark in the tunnels. That she had not expected. Once her eyes had adjusted, she could see little will-o'-the-wisp lights, so faint and pale that they had hardly any color at all: swamp gas, foxfire, Willis, whatever they were, they were welcome.

She heard a quick, quiet scuffle down the tunnel behind her, then a *thwuck*.

Silence again. "Van?" she called. "Major Vandennour?"

The dirt walls swallowed her words and there was no reply. Painfully she rolled herself over, turned around and crawled back.

The mouse-dropping odor was very strong. She touched the switch of her little helmet light and saw that the major was dead. One of the burrowers had been here, and the dart that protruded from Vandennour's face proved it.

"Shit," whispered Margie and belatedly lifted her head and drew her pistol. The light showed nothing for sure down the crooked, uneven tunnel—was that a glint of something? A reflection from an eye? She fired twice.

When she looked again there was nothing there. But every few meters there were little side passages and bays, and a dozen Creepies could be waiting there for her to turn her head.

Almost she raised her voice to call the others back but stopped herself as she was opening her mouth. For what? They could not bring the major's body back. Doubled over as it was—he seemed to have been turning when he was shot—he almost blocked the tunnel; and maybe that was the last service he could render his cause, to slow down pursuit.

There was a better way. She had two grenades left. She pulled one off her belt, set it to ten clicks, turned around and scuttled as rapidly as she could after the others. When she had counted a hundred seconds, she dropped, locked her hands over the back of her neck and waited for the distant, muffled thud that told her she had dropped a part of the tunnel roof down to bury the major.

When the grenade had gone off, it occurred to her that it was strange she had not caught up with the others. "Sam! Chotnik! Sound off!" she cried. They didn't answer; they hadn't heard her order to stop. She left the helmet light on and hurried after them, the pain in her knee no longer signifying. When the red numerals on her watch told her it was time for the nuclear blast, she still had not caught up.

She rolled over on her back again. For this blast it did not matter whether she protected her neck. She would be killed or she would not, and the only factor that mattered was whether there was enough earth between her and the explosion. There should be. When the impellers drove the sets of plutonium needles in to mesh with each other, there would be a nuclear blast. But not a big one. They would not stay in contact for

more than a few microseconds. If she had placed them right, they would expend their force up through the roof of the tunnel, carrying the Greasies' arms stores with them, and not much else. If she had placed them right. She was far less sure of that than she had pretended to Vandenour and the others. The maps that Tinka and the Indonesian had given their lives to get to her were extremely complete and clear. But reading them in the open air was one thing, trying to follow them as you crawled from level to level underground was something quite different. She was not even sure that they had followed the same route on the way out as going in. They should have drawn a silken cord after them, or broken off bits of gingerbread cookies for a trace—

At that moment the explosion occurred. Right on time. And she was still alive.

It was not even frightening. It was, she thought, as it must have been in her mother's womb if her mother had fallen. Some external event had taken place. But here in the tunnel she moved with the ground and even the sound of the explosion was too huge and slow to be frightening.

So that part of the plan, at least, had worked. Now if Kris could rally the patrol to the attack—

If they remembered their radiation ponchos and the wind was not too unfavorable—if the Greasies did not pull themselves together fast enough to resist—if the bomb had been in the right place after all—There were too many ifs. Her place was with her troops, not here.

A sighing, slithering sound a few meters behind her caught her attention. She turned the headlamp toward it and saw that a section of the roof had collapsed into the tunnel.

Shaken loose by the nuclear blast? Maybe. More likely not. Creepies had been known to try to trap a foe by plugging tunnels before. She was terribly easy to find and follow with the trail of blood from her knee.

It was time to get out of there. Doggedly detaching herself from the pain and from the fear that one of them was silently creeping up behind her, she resumed her crawl.

In ten meters her head struck dirt.

The burrowers had closed both ends of the tunnel.

She turned on the light again. It was fresh dirt. She whirled quickly. Nothing moved behind her. She was alone.

Margie Menninger said to the wall, "The most basic human fear is of being buried alive." She waited for a moment, as though hoping someone would answer. Then she pulled out her pistol with one hand and reached for her entrenching tool with the other. It wasn't there. Suddenly she remembered she had left it where they had assembled the bomb.

Fingers then.

She dropped the pistol and tore at the dirt plug with her bare hands. Furiously. Then in terror. At last because there was nothing else for her to do.

From horizon to horizon, as far as Charlie could see, there was a solid undercast of clouds and taller ones poked up all around. The storm was weakening off toward the ocean but here, where the Greasy camp lay somewhere below, it had been hours since he had seen the ground at all, days since he had last seen the little party of his friend 'Anny. And it was impossible to stay on station! At all levels up to ten thousand meters and more the wind was strong and solidly toward the Heat Pole, and it dragged him remorselessly away. Charlie could read the fraying of the anvil-shaped tops of the cumulonimbus; it showed that at fifteen thousand meters there was a return flow. But he and the two females that survived of his flock were worn and tired. They had lost much lift. It took them forever to reach those lofty levels.

As they labored upward, a new flock came sailing down from the Pole and Charlie led his tiny fragment to join it, eager for a new audience for his songs about the new friends from Earth, hungry to hear songs he had not heard before. It had been long

and long since he had joined in a proper eisteddfod and his soul ached for it. The new flock was small, less than sixty adults, but there were voices in it he had never heard and he sang greeting toward them with joy.

White light flashed across them.

The flare caught them all by surprise. Charlie was one of the fortunate ones. He was facing away from the blast and so he was not blinded at once. He saw the high cirrus starkly outlined, blue-white against the sullen crimson Jemman sky, saw the shapes of the new flock picked out in brighter, sharper colors than he had ever seen. Minutes later he heard the sound and behind him and below a new thunderclod boiled up out of the undercast.

Chorus of welcome became a dirge of pain and fear. Charlie could only reply with a lifting song. The seniors of the new flock took it up and the swarm dropped ballast, belched swallowed hydrogen into their sacs and rose. A few did not. They were not merely blind, they were in pain too great to respond.

Although they were far from the blast, when the winds struck the swarm was thrown helter-skelter across the sky. Charlie had never felt such gusts before. Always in other storms there had been warning, gathering clouds and the deadly play of lightning to tell them it was time to swallow hydrogen and ride out the storm or soar to escape above it. This time there was no warning and no escape. His feeding flaps and winglets felt as though they were being torn out at the roots. Captive of the huge sail of his surface, he was thrown through the new flock, caroming off their seniors, cannoning balloonets out of the way.

And then, without warning, he felt the familiar creeping tension of the surface of his gas-sac and recognized the sweet, stinging odor of the females. Oestrus, swarming time, time to breed!

The spinnerets of the females were working furiously now, spraying threadlike ova and pheromones into the air. All around Charlie, and for all the males, there was no question about what to do next; Hive up, spray milt, soar back and forth through the stinging mist while their teats elongated, convulsed, spread their seed. The skins of their air-sacs tightened, drawing the features of their tiny faces into caricatures. Behind the expressions that looked like pain was pain. The overtures to sex were no joy to Charlie. They were like being locked in an Iron Maiden with acid-tipped spikes. Only the relief that came when the semen squirted out made the pain end.

But it was wrong, wrong!

Charlie sang out his question and his fear, and the new flock sang with him. What breeding was this with the flare coming from the enemy ground and not the sky? What was this heat that smote them like a fist, following on the thunder and the wild gales? Charlie could see that in the turbulence most of the silkings had been missed by the milt. They were all over the sky. Within his own body he could feel it was wrong. Where was the bubbling of hydrogen to replenish his sac, radiation-stung out of his body fluids? And what—what was this monstrous bubbling cloud that was growing so fast it was drawing them all toward it? And that was the question that answered all the others and put an end to questions forever for Charlie as the searing heat of the nuclear cloud burned out his eye-patches, cracked his gas-sac, touched off the hydrogen that spilled out, and ended his songs for always.

### XXIII

**A**S NUCLEAR EXPLOSIONS WENT, it was considerable. Less than a kiloton, it would hardly even have been noticed in the multi-megaton blasts that scoured the surface of the Earth. When the imploding grenades forced the bright plutonium needles out of their sheaths to mate, they were in contact for only a few

microseconds before their own immense reaction drove them apart.

But by then the explosion had occurred. The needles, the shell, the walls of the tunnel around them had been vaporized to a hot gas, billions of atmospheres pressure, irresistibly determined to escape. It escaped. Within a few thousandths of a second it had formed its pipsqueak fireball, fifty meters across, racing upward at five hundred kilometers an hour, brighter than Kung, brighter than Earth's sun, brighter than hundreds of them put together. The fireball grew and soared, first bright red with its burden of nitric acid, then whitening and losing its brightness as it began to cool.

Even through closed eyes, that stark flare was visible to the people huddled in the cave, and the shock-front that swept over them shook cave and their bodies. The noise was immense. After it, over the echoes, Kris Kristianides was shouting, "Stay down! Don't open your eyes! Wait!" For nearly ten minutes she kept them there, and then slowly she peered through half-closed lids and the dark goggles and announced that they could get up.

Tentatively they poked their heads over the ridge. Squinting, they saw what Marge Menninger had done.

The nuclear cloud boiled tall through the layers of stratus. It had punched its own hole in the rainclouds, but its mushroom top was out of sight. Nearer, the Greasy camp seemed hardly touched; a shed blown over, a couple of tents burning, people moving dazedly around.

"She—she missed the base!" cried Kris, and Danny Dalehouse could not tell whether her tone was angry or glad. But what she said was true. The bottom of the blast was half a kilometer away from the camp, toward the Heat Pole. Marge had got herself lost. The half of the blast that went into explosive pressure had wasted itself on the sand and succulents of the steppe.

But the third that went into heat had done better. The nearest persons in the Greasy camp were staggering around, blind and in agony. No one had given them goggles. No one had warned them not to look toward the blast.

"Check your pieces," Kristianides ordered. She had taken the goggles off, and under them her eyes were red. But her voice was determined. "Put on your cloaks. Let's go. We're moving in."

Dalehouse stood up and pulled the plastic poncho over his head like an automaton. (Would that really protect against any fallout at all?) He picked up his recoilless and slapped a cartridge into the breech. (Why am I doing this?) He started off with the others in a ragged line of skirmish, all nine of them, walking slowly toward the Fuel base.

At every step he was telling himself that it was *wrong*. Wrong tactically: the nuclear blast had knocked out no more than a few unfortunates, they were likely to get their heads blown off by the survivors. Wrong strategically: they should never have allowed themselves to get into this position. And wrong, most wrong of all, morally. What kind of world were they fighting for, where they killed people without warning?

Dalehouse looked uneasily back and forth at the others in the line. All were staring straight ahead at the Fuel camp. Didn't any of them feel the way he did?

He stopped in his tracks. "Kris," he said, "I don't want to do this."

She turned slowly, so that the muzzle of her gun covered him. "Move your ass, Dalehouse."

"No, wait, Kris. Let's—"

She said tightly, "I was expecting this from you. We're going in there, all of us. Colonel Menninger set this up, and I'm not going to let it go to waste. Now move it."

The others had stopped to look at them. None of them spoke, only waited, while Dalehouse watched the barrel of the GORR come into line with the bridge of his nose. He sighed deeply

and said, "No, Kris." And then he stood there as her expression changed and hardened and he realized that, yes, she was going to pull the trigger—

"Put down your rifle, Lieutenant," Ana called. She was behind Kris and a little to one side, and she had her own gun pointed firmly at the lieutenant's back. "I do not wish to kill," she said. "But I, too, do not want to attack this camp."

Dalehouse didn't wait to see what would happen. He stepped forward and took the GORR from Kristianides's hands. He threw it back over the crest of the hill they had just crossed, and then followed it with his own. After a second Ana did the same and so, one by one, did the others. "You fucking fools!" Kris raged. "They'll shoot you down like rats!"

Dalehouse did not answer. He stared toward the Greasy camp, where a few persons who were not blind or incapacitated had begun to appear. They had weapons, and they were gazing at the drama on the hill.

Dalehouse raised his hands over his head and began to walk steadily toward them. Out of the corner of his eye he saw Ana doing the same thing. Maybe Kris was right. Maybe one of those armed people kneeling in the shelter of a smoldering tent would begin to shoot. But it was out of his hands. Whatever guilt there was, it would not any more belong to him; and for the first time in months, he felt at peace.

## XXIV

And so, at the last, what can one say of them? What is to be said of Marjorie Menninger and Danny Dalehouse and Ana Dimitrova—and of Charlie and Ahmed Dulla, or of Sharn-igon and Mother d'Shree? They did what they could. More often than not, they did what they thought they should. And what can be said of them is what can be said of all persons, human or otherwise, at the end: they died. Some survived the fighting. Some survived the flare. But in the long run there are no survivors. There are only replacements. And time passes, and generations come and go.

And then, what can one say of that beautiful and powerful woman named Muskrat Greencloud An-Guyen?

One can say that she bears the traces of Margie and Nan and some of the others. Some through the passage of chains of DNA, some only because of what they did or who they were. She never knew any of them, of course, because they are all six generations dead; she is a replacement.

Like all of us, she is not a single person. She wears three personas, or six, or a hundred if you count the subjective memories and stereotypes other persons carry around that bear the label "Muskie An-Guyen." To a former lover, she is the sweetly sweaty companion of a weekend at Lake Hell. To her grandchildren, she is the docent who leads them through the museums and the zoo. To your average registered Republicite lot-caster of the Boyne-Feng Metropolitan Area, she is the selection judge who supervises the machineries of government. Or, actually, of nongovernment. Muskie is one hundred percent solidly behind the Six Precepts of the Jemman Republics, and *No strong central government* is the last and maybe most important of them. "Government" is a dead wickedness to Muskie, burned out in the blast and starved in the Desperation. It has been gone from Jem this century and a half. No one wants to see that pawkish horror back, least of all Muskie. It is as obsolete as armies and indolence and waste. Muskie will keep it so, if it demands her last drop of blood as well as the utmost sacrifices by her militia volunteers and gift acceptors.

As she walks across the pleasant gardens toward the place where she sleeps and keeps her belongings, a short, pale youth pushes toward her through the shrubs. He is d'Dalehouse Dolphin An-Guyen, and he is one of her sons. He has been



running. He is breathing hard. Muskie sighs and says, "How nice of you to hurry to give me Ring-Greeting, Dolph."

He stops and blinks at the pretty Christmas many-tree in the center of the garden, with its ring-shaped lights and yellow Star of Earth at the top. Obviously he has forgotten about the holiday. Muskie sighs again. "Merry Christmas anyway, Dolph. I know you're going to reproach me some more. Sit down and catch your breath first."

They sit on a pressed creepstone bench under a grape arbor. (A few raisins had survived the flare-storm under a bunk in that Outpost of the People. From the six germinable seeds that were found in them had come all the wine on Jem, and this arbor.)

Muskie does not look at her son. She knows that in spite of his faults, he is too well brought up to begin before she has given him encouragement, and she wants him to feel the peace of this place. All around the garden are the statues of the First Generation, the eighteen Mothers in gold, the fifty-two Mares in crystal, the eighty-nine Fathers in granite quarried from the cliffs under the Heat Pole. (The twenty-one survivors who contributed no genes to the pool, even by cloning, have statues too, but they are ranged outside the park. None of them were even mares.) There are further distinctions in the statues. The eighty-one survivors who returned from Farside have their names picked out in frost-etched silver. The thirty-two who survived in the burrows under the Outpost of Food when the flare caught them before the ferrying to Farside was complete are marked in ruby. And the sixty-seven others—few of them viable—who survived the flare in caves, under machines, inside space capsules, or wherever they could hide from the rage of the star are marked in orange chrysolite, the color of flame. That was six generations back. Muskie could have been descended from 2<sup>9</sup> of them, more than a third, but actually only eleven are truly her ancestors, with considerable overlap. (For instance, she is quintiply each descended from Marjorie Menninger, Ana Dimitrova, Nguyen Tree, and Firstborn McKenzie, the tiny phocomelic child born to the one woman who survived both the nuclear bombing of the Outpost of Fuel and the flare. She lived only long enough to bear her damaged child, but the child was marvelously fertile.)

When Muskie feels that this holy place has done all it can for her son, she scratches below the waistband of her slacks and says, "All right, Dolph, you may as well say it."

He cannot wait to get the words out, he is so impatient. "All right, I'll say it! You've made a mistake, Mother Muskie. We can't say no to Alphabase!"

"Can't?"

He is doggedly stubborn. Even ferocious. "Yes, that's what I said, *can't*. It's a crime against the human race! Jem's rotting away before your eyes, Mother Muskie. This is the best chance we've ever had to get things going again. They've got high-energy technology on Alphabase! Do you know what it means, what they're suggesting? They're able to put ten tons standard into the tachyon charge state—we couldn't do that to save our lives."

"Dear Dolph," she begins, sweetly reasonable, "we have more pressing problems right here on Jem. Do you know how many wild flocks of Loons there are? Krips who still wallow in savagery? Creepies unreachable and unbenefted. We have a duty—"

"We have a duty to humanity!" he cries.

"Yes. Certainly! And we are carrying it out. Our ancestors gave their lives to save us, and we are true to the Six Precepts. There is no tyrannical government, no coercion, no contending nationalities here. We haven't raped Jem, we've wooed it. We live off renewable resources, while the Alphas are back to industry and the evils of technology."

"Dear God," he shouts, "resources? The quarter-million of us don't begin to scratch the surface of them! Do you know that fossil fuel is forming faster than we use it?"

"Good! Proper! That makes it renewable. But be reasonable,

Dolph dear. Why spoil everyone's happiness by striving for something foolish? Suppose everyone wanted to do what you say. Who would mine these fossil fuels?"

"Krips. Creeps. People. Machines! I don't care. If they don't want to, they should be ordered to!"

Muskat is shaken. "You have spoiled my Christmas," she says sorrowfully, and walks away. What a shame! A foolishly stubborn boy and her whole holiday was ruined before it had rightly begun. Dolph is her favorite son, or often is. She admires his tiny, quick body and his bright mind. But what rot, really! What a bore! Why can't he accept paradise like everyone else and be happy in it?

Dolph's holiday is spoiled, too, and he sits on the creepy-stone bench so angry and frustrated that he does not even hear the carols beginning.

*A'es'e fi'eles,  
lae'i'riumphan'es.*

If only she could be made to understand! The winning of Jem had cost so much in blood and pain. Not just in that first terrible year. Over and over again, every time Kung had flared in those first decades. There had been eight flares since the days of the ancestors, and only the last two or three had been fairly painless. Plenty of warning. A frenzied rush to inproof the domes and hustle essential perishables inside. A work of confinement while the star raged, a year or so of one or another kind of scarcity until the planet replenished itself. But that left half a dozen sieges of misery, the first worst, but all of them catastrophic. Was all that to go for nothing?

*Veni'e a'oremus,  
'Ominum.*

A Creepie overseer darts whickering past him toward the many-tree, followed by four noisy Krintpit gardeners in their bright red and green Ring-Greeting coats of lacquer. He becomes aware of the choir belatedly.

*—save us all from Sa'an's power  
When we were gone as'ray—*

Hell of a season of joy this is, he thinks to himself. Season of suicide! Time of deciding to die on the vine while all the rest of the galaxy goes on to who knows what triumphs of technology and adventure! Gloominess battles Christmas inside him. Gradually gloominess loses. He remembers what the Creepie had been carrying—palely glowing ultraviolet strobes—and decides to stroll over to the Christmas many-tree.

The Krintpit are pushing away benches and picnic tables to make room, moaning and clattering to themselves; they finish and scuttle away. The Creepie positions his strobes and waits for orders. On the tree itself, the tethered balloonists are singing their little hearts out.

*Schlaf im heilige ruhe,  
Schlaf im heilige ruh'.*

All around the tree young people like him are removing their clothes and slipping in between gaily decorated trunks. "Time to start!" they cry; and the Loons begin the jolly, lively "Good King Wenceslas." Obediently the Creepie touches off the strobes. The Loons gasp and continue to sing and begin to emit their milt, and all under the lovely tree the couples link in the traditional Rings.

And Dolph can stand it no longer. Gloom loses. Christmas wins. He flings off his clothing and plunges into the trunks of the many-tree. Why fight Utopia? he thinks to himself. And so in that moment he completes the process of growing up. And begins the process of dying. Which is much the same thing.



# MAPPING THE ISLAND IN IMAGES

by Robert Frazier

The Four Shores  
Beta Bernal, resonant  
orbit, 2080

1)

like the albatross mating in flight  
the solar panels  
in vast double wingspread  
pinwheel with a titanium whisper  
through the abyssal twilight  
my dreams have turned with them  
these sun-catchers  
lame and unsure in migration  
on the solstice path to tomorrow

2)

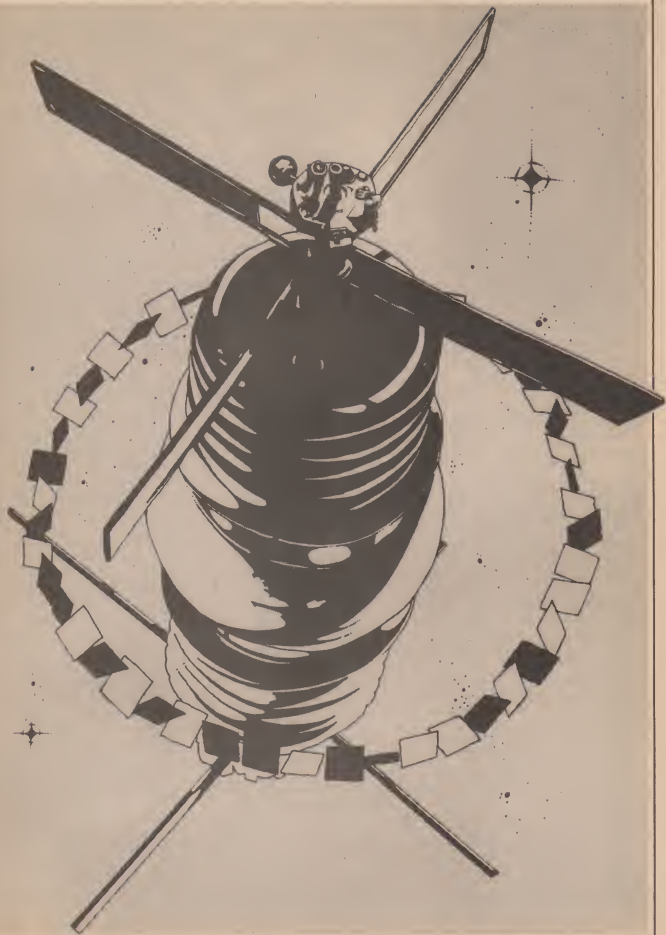
flawless and glass-edged sharp in its curvature  
the Bernal habitat  
a head leaping up from the crouch  
cuts a shadow out of the glare  
in this well space darker than space  
my body sweats inside  
crewing a surface repairs excursion  
yet cools in that soft music  
a haven from an unending diurnal life

3)

like foxfire in the forest dark  
or like a battery  
hooked to the engines of silent mystery  
my soul recharges  
with the great girthing chain of mirrors  
which bends the sun  
casts the diastolic power of atoms  
to the naked gaseous heart  
of this living artifice we call home

4)

in the V between two agricultural tori  
my flesh, soul and dreams burn  
in nuclear fusion  
molded into a one-piece future  
a grasping fist  
by the light that falls in quills  
raw and actinic  
a gut-wrenching echo  
of the naked star we adhere to



# Reviews

edited by  
Noralie Barnett



MONSTERS IN THE SKY

by Paolo Maffei  
translated by

Mirella and Riccardo Giacconi  
MIT Press, \$15.00

Reviewed by Hal Clement

**M**AFFEI'S MONSTERS are not those of old legend or modern tradition, though he starts with comets and ends with black holes. Most of the items in between have names totally strange to the average citizen, such as Seyfert galaxies and BL Lacertae objects. The title is well chosen, however. Most of these objects, if they were located anywhere near our planet, would cause terror among human beings for much better reasons than can ever be found in astrology; they could crush, vaporize, or otherwise dispose of our world with all the casual ease of a superweapon from a space-opera yarn of the thirties.

From my point of view, the best thing about the book is its completeness. While it is in no sense a collection of mathematical articles from the *Astrophysical Journal*, it is far more than a sensational collection of descriptions. Dr. Maffei goes into the observational history of each object, gives a clear account of the reasoning for and against various interpretations of what has been seen, and where—as is usually the case—there is still a fair amount of doubt about what is going on, he at least has removed some of the wilder possibilities.

In the comet discussion, for example, the pros and cons of the various explana-

tions for the Siberian explosion of 1908 are very well covered; I approve of the discussion, not merely because it reaches the conclusion which has been held for a long time by most conservative astronomers—that the impacting object was an icy comet nucleus of the Whipple “dirty-snowball” variety.

The various “black hole” interpretations of some of the apparently very energetic stellar and quasi-stellar objects are very well covered, also.

In a few places, there may possibly be translation slips. On p. 156 is the statement “main sequence stars are heavier and more luminous.” More luminous than what? One suspects that the author’s intended point was that main sequence stars are more luminous the heavier (better, more massive) they are.

On p. 100, the statement is made that the time of the demise of the dinosaurs can now be narrowed down to no more than 10,000 years. I wish Dr. Maffei had given some idea of how this is accomplished; I know techniques have improved over the years, but I thought there was still an uncertainty of four or five percent in most of the radioactive dating methods. I admit I’m hedging; I don’t like to call a professional categorically wrong, but still I have my doubts about this one.

But don’t let that bother you; if the question is important to you, you can always check it. If you want to write hard-science space opera, or be able to spot the wilder nonsense in a modern black hole discussion, get the book.



THE GOLDEN MAN

by Philip K. Dick  
edited by Mark Hurst  
Berkley, \$2.25

Reviewed by Alan Ryan

**O**NLY RARELY DOES A BOOK honor its readers. This one does.

*The Golden Man* by Philip K. Dick contains fifteen previously uncollected stories that were published originally in a variety of magazines between 1953 and 1974. What we have here is a representative selection of work, written over a span of more than twenty

years, framed between an astonishingly personal and revealing introduction and a set of retrospective story notes that, by turns, explain, puzzle, question, apologize, plead. The result is a book that will have to be regarded as a major text in the literature of science fiction and the illuminating personal document of a major writer.

Dick’s stories and novels have, from the very beginning, made an equal appeal to both intellect and imagination. His mind ranges so widely and deeply that comparisons to writers as diverse as Samuel Beckett and Tom Stoppard are not out of order. The stories included here are ample evidence and this would be an important book if it contained nothing more. And what kind of stories are they? Are they any fun? Well, there’s a story in which a crazed pinball machine starts scoring on its players. And a story about a flock of bloodthirsty butterflies. Then there’s the one about a determined robot that comes to your house and won’t go away till you buy it. Oh, and the one about an alien invasion in which the aliens come disguised as three-foot high real estate salesmen. Then there’s the one... Yes, the stories are fun. And, through the fun and the wit, they raise questions, basic questions, that stretch the intellect along with the imagination.

Even those that are merely interesting and workmanlike display the kind of consistent entertainment value on which science fiction magazines thrive: “Meddler,” for example, or “The King of the Elves,” or “Small Town.” The fact that these stories have gone uncollected through the years, however, should not suggest that they come from the bottom of the barrel. There isn’t a bad or boring story in the lot, please understand, and even the slightest of them has something to recommend it. Dick’s casual stories—and he was a prolific writer of magazine stories early in his career—are all good and intelligent entertainments. “Small Town,” for instance, a familiar and predictable yarn about a man who constructs his own scale-model reality in the basement, is painstakingly detailed, convincingly told, eerily memorable, and raises a constant theme in Dick’s writing, the question of reality and how the hell will we know it when we find it?

For this new collection, Dick has written an introduction that deserves a prize of its own for its honesty, its self-revelation, for the brilliance and strength of its prose, and for the glaring light it throws on the condition of the serious writer in these our times. A few other writers whiz through these pages too, for example, Norman Spinrad (“Norman has the worst temper of any living mortal”) and Harlan Ellison (“Harlan hates my guts...but I love that little bastard. He is a person who really exists.”) But mostly Dick talks about himself.

Listen: "I'd like to get (God) here where I could interrogate him, tell him that I think the world is screwed up, that man didn't sin and fall but was pushed—which is bad enough—but was then sold the lie that he is basically sinful, which I know he is not." The strength of Dick's anger and frustration is in those last half dozen monosyllables.

Or this: "I want to write about people I love, and put them into a fictional world spun out of my own mind, not the world we actually have, because the world we actually have does not meet my standards. Okay, so I should revise my standards; I'm out of step. I should yield to reality. I have never yielded to reality."

Or this: "My writing, in toto, is an attempt on my part to take my life and everything I've seen and done, and fashion it into a work which makes sense."

This is the sound of a writer at the maturity of his talent, with a large body of work behind him, with many of his personal gauntlets safely traversed, and much of the journey rearranged, fictionalized (most notably in *A Scanner Darkly*), refashioned so that, at last, it all begins to make sense.

The same honesty and self-revelation run through the notes on the stories, as Dick looks back at work done years earlier. "The theme of dangerous toys runs like a tattered thread throughout my writing... I was at a sort of halfway point between doubt and faith. Years later I'm still in that position... The theme of *caritas*, (or *agape*) shows up in my writing as the key to the authentic human... I am convinced that anything can be faked... I may be reading too much into this simpleminded early story, but... This ending is not good. The fans were right... Joanna Russ wrote me the nastiest letter I've ever received... I have always managed to offend people by what I write... Sorry, people... Either I've invented a whole new logic or, ahem, I'm not playing with a full deck."

These notes tell us a good deal about the younger writer who created these stories. Even more, they show us the writer as he is now, able to comment and evaluate and even occasionally smile, wan though the smile may be. And there is something more as well. Dick has, in the past, been noted for his anger, despair, mistrust: a prince of paranoia. But we meet now, in these pages, a man who asks us to observe, in the work he presents, "a theme of human trust." He asks that we not misread the stories and "see dislike and anger only," because the anger "is generated out of love." His anger, he declares simply, rightly, is "love baffled." Here is a writer who, perhaps at last feeling himself on safer ground, has come out into view to ask for a more proper understanding. He deserves it, as well as our respect, for the stories, the questions, the honesty, the

brilliant wedding of conviction and craft.

*The Golden Man* will be indispensable to anyone interested in tracing the evolution of some of Dick's ideas from stories into novels. "The Mold of Yancy" (1955), for example, later turned into *The Penultimate Truth* (1964), "The Little Black Box" (1964) developed into *Do Androids Dream of Electric Sheep?* (1968)—Dick feels the story is more successful than the novel—and "Return Match" (1967) features Officer Joseph Tinbane, a central character in *Counter-Clock World* (1967).

If the book is marred at all, it is only by the embarrassingly breathless, if mercifully brief, foreword by the editor, Mark Hurst. And, although Dick asks in the notes that we read "The Little Black Box" last of all the stories, the editor has chosen to place it in the middle of the book. Well, it's not a perfect world...

*The Golden Man* has already made 1980 a distinguished year for science fiction. And Philip K. Dick is playing with a full deck, all right. He just doesn't have the same cards we do.



THE SPIRIT OF DORSAI

by Gordon R. Dickson  
Ace Books, \$5.95

Reviewed by Clifford R. McMurray

GORDON R. DICKSON is a proponent of the theory that the progress of the human race is made, not in a slow and steady upward line, but in quantum jumps. His own writing is a strong argument in favor of this theory. The first quantum leap of improvement came in the early sixties, with the publication of *Necromancer*. Another quantum jump was made only a few years ago, in *The Far Call*. That second dramatic improvement is now bearing its fruit in such work as this volume, which contains the first new Dorsai story in nearly five years.

*The Spirit of Dorsai* is another of the heavily illustrated trade paperbacks Ace has been experimenting with recently. The illustrations are of uneven quality,

and of such varied style as to lead one to suspect that they were done by more than a single artist. The name given for the illustrator, Fernando Fernandez, certainly sounds like a pen name. The illustrations aside, this is one of the few trade paperbacks thus far produced to justify its purchase price on the quality and quantity of the text. It consists of one novella and one novelette, surrounded by stage-setting passages from the next Dorsai novel, *The Final Encyclopedia*. The stories are what Dickson calls "illuminations" of the Dorsai series, also called the Childe Cycle. They are intended to add further depth to the series by exploring some aspects of his future history not dealt with directly in the main story line.

These two stories of the Dorsai, the people of a world whose principal export is the services of their men as mercenaries in the wars of the other human-settled planets, are drawn from incidents mentioned in previous novels in the series. "Amanda Morgan" is the tale of the first—and last—time anyone ever attempted to invade Dorsai.

As explained in *Tactics of Mistake*, in the days when Earth's colonies were young, Cletus Grahame brought his revolutionary theories of warfare to the Dorsai and set them on their road to supremacy in their trade. They became so effective that the other worlds were no longer dependent on Earth to settle their disputes. Earth attempted to undo everything that the Dorsai had done, by drawing all her soldiers offworld into a dozen foreign conflicts, then invading their unprotected homeland. All that was left to stand against them on Dorsai itself were the families of those soldiers—the women and children, the sick and crippled, the aged. But using Cletus' theories they were able to defeat Earth's best troops.

This is the story of the defense of Foralie, Cletus' home district, led by a ninety-three year old woman (to my knowledge, the first time Dickson has ever used a woman as the lead character in a story). It is a tale of loving sacrifice of some so that their people may live in freedom. Dickson has seldom written more powerfully, and his first real attempt at female characterization is a complete success. The richness of description and multiple layers of meaning demonstrate that where Dickson was strong before, he is now all but unmatchable.

"Brothers," previously published in *The John W. Campbell Memorial Anthology*, shows the old Dickson at his best. It completes the story partially told in the Hugo Award winner *Soldier, Ask Not*, of the assassination of Kensie Graeme on the backwater world of St. Marie, and the avenging of his death by his twin brother Ian. Dickson has been accused by some of

[Continued on page 72]



# Michael Kaluta: Storytelling Fantasy Artist

by Floyd Kemske

**W**HEN THE MARVEL COMICS Group held its big Marvel Comic Convention in New York, one of the exhibits was a display case with an original painting by Michael Kaluta. The display, however, was designed to show how a cover painting might be unsuitable for Marvel until the Production Department had modified it. The artist found himself drawn toward the cabinet holding his painting, but in typical Kaluta fashion he was more interested in the spectators than the display. He could not help eavesdropping on the conversation of a father and his young son.

"See," said the father, "this shows what happens when the painting is unsuitable. They touch it up and make it better."

"How is it better?" said the little boy.

"Well, look," said the father. "See how big the teeth are? And look at the

blood in there." The father then walked away toward another exhibit.

The little boy remained at the display case for a moment, then finally pointed at Kaluta's original. "You know," he said, "I like that one best."

Kaluta smiles when he tells that story. "That's all I needed," he says. And it does seem to be all he needs. He is an artist who works to please a little boy rather than a production department. The anecdote has a larger symbolic value, however, because when you talk with him you have the feeling that he paints exclusively for the sake of a little boy, the little boy inside him. The one he is telling stories to.

Michael Kaluta is one of the foremost practitioners of the new narrative art which, already well-known to followers of fantasy and science fiction, has gained a modest foothold in modern culture. It has gone by various names and perhaps the

most popular is the term New Romantic Movement, but this term is shorthand at best and there seem to be as many artists who resent this term as embrace it. "Actually," Kaluta remarks in his cryptic way, "there are very few people moving in the New Romantic Movement."

Regardless of what it is called, there is an artistic style, heavily indebted to the narrative requirements of comic books and the illustration of fantasy and science fiction, which is supporting a growing number of young artists. The main features of this style are the use of fantasy and mythological subjects, bright colors, heroic poses, and painstaking attention to detail. In addition, the paintings from this "school" have a definite narrative quality as shameless in its intent to entertain as a good science fiction novel. In fact, the New Romantic style's preservation of the storytelling values of visual art (in the face of the increasing irrelevance of "serious" art to the human experience) is reminiscent of science fiction itself.

## EMOTIONAL COMPOSITION

Kaluta's conversation is a succession of colorful and unusual images, peculiarly emancipated from constraints of time or place. At times he seems to be talking about things which have happened. At times he actually seems to be reliving them, interspersing the events with



## Potter on Books

### THE STUDIO

by Jeffrey Jones, Michael Kaluta,  
Barry Windsor-Smith, Berni Wrightson

*Dragon's Dream*, \$14.95

*Galaxy* has a very able Review Editor and I want to let you know at the outset that she is not to blame for this column. You might have gotten that impression since this is a book column and since it resembles a review. This column is part of Floyd Kemske's editorial conception (that's his phrase, not mine). He assigns books to me after considering, not what I want or even what books ought to be reviewed, but what might "support" the feature article.

When Floyd handed me this copy of *The Studio*, I pointed out to him that it's an art book and I don't know anything about art. To me, a Campbell's Soup can looks like a soup can; a canvas randomly splashed with paint just looks like a mess. I'm not qualified to review an art book. I know it. You must know it (if you've read this far). Floyd knows it, too, but he insists this editorial conception of his is bigger than both of us.

direct quotations and fragments of interior monologue. His attempts to describe his own working habits, for example: "In between coffees or sitting at a bar watching somebody, I'll be sketching them, but something will pop into my mind, part of a popular song or something. The sketch will go down in the sketchbook. Then, later on the sketch will come back to my memory while I'm doing something else. The two things will fit together. I'll say, 'Well, maybe there's a picture hiding in there.' And I'll start keeping it in a special place in my head where I can enjoy it. I'll look in on it now and then and see how it's growing, how it's changing, until it becomes something that affects me personally."

In fact, his life, like his conversation, seems to have been such a succession of images. While most people develop intellectual maturity by searching for logical relationships and discerning uniformities in their environment, Kaluta has grown by discovering anomalies in the world around him. Born in Guatemala to a military family and moving around a lot as a child, his memories consist largely of small tropical animals, aircraft, scraps of childhood lore, and television programs about space.

A childhood dominated by daydreaming gave way to art education at the Richmond Professional Institute. He was not very enamored of "serious" art,

He graciously reminded me that the editorial conception depends on "Potter on Books." On the other hand, he explained, there is a virtual brigade of Potters in the Boston telephone book alone and if one Potter doesn't want to write the column, perhaps...

"Well," I said at that point, "at least I can tell the readers what the book is like."

"That will be sufficient," said Floyd. He talks that way sometimes.

Well, then. *The Studio* is a book well worth reading, or looking at, or whatever combination thereof is appropriate for an art book. It is a handsome package, too. It measures twelve inches by twelve inches and has 159 heavy-stock pages, every one in full color. It shows attention to details, such as dating all the paintings. This isn't really a book review, however, and I'm going to do what I want. I want to review the binding. Some of us read books pretty hard and for those of us who do, the pages of *The Studio* become prematurely suitable for framing.

Apart from the binding, however, the book is not only good, it is important. These four artists are (or were) residents of the same New York studio, a base to which they all repaired after abandoning the comic book industry. As I understand it, the publisher originally wanted to do a book on each artist, but they are all pretty young and they themselves decided that



Michael Kaluta

which seemed to lack entertainment value, but learned the fundamentals of composition in spite of himself. In typical Kaluta fashion, however, he never learned composition as a set of rules, but as an internal response to a design. "Emotional composition," he calls it.

After school, he went into the comic book industry, where he worked on *The Shadow*, *House of Mystery*, *House of Secrets*, *Batman*, *Detective*, *Conan*, and others. He liked drawing stories, but he

none of them had a large enough portfolio to make a whole book. Somebody had the idea of doing them all together.

The effect is remarkable. The book is divided into four sections, one for each artist. Their styles are distinctive and even I can tell them apart. At the same time, however, there is a unity of theme, tone, and purpose which is unmistakable. Maybe it comes from sharing studio space, I don't know. I don't know anything about art, remember? But each

## Pages from the Sketchbook of Michael Kaluta

*Michael Kaluta carries two sketchbooks with him wherever he goes. He uses them to make visual notes, to catch interesting poses and angles for future reference. Sketchbook drawing is his favorite kind of work, as is obvious from the exuberance of these penciled pages. He consented to part with a few pages from the sketchbooks and we have reproduced them here and on some of the following pages.*

could not quite assimilate the money-making ethic of the comic business. In fact, his work there was not very economical for him because he tended to put too much into it. Comic book interiors, like commissioned pictures, cost him too much time for the return. He tends to finish pictures to an extent which is not economical because, as he says, "The picture commands, not the price." He still does comic book covers from time to time, but his work is more

artist paints in a way which is representational, sympathetic, and dynamic. Each is partial to the general theme of individual human experience. Each is indebted to the heroic style of comic books, although some of them have larger outstanding balances than others.

I suspect they put Jeffrey Jones first in this book because of alphabetical order, but it was inspired placement all the same. His work establishes a sophisticated tone which makes the viewer think



These four artists are (or were) residents of the same New York studio, a base to which they all repaired after abandoning the comic book industry.



he must be in the presence of a master. Economy of line, visible brush strokes, and complicated realistic colors are the most obvious characteristics. The real world is not colored with pigment squeezed right out of a tube, and neither is a Jeffrey Jones painting. He mixes up the paint until he gets the colors right; the result is subtle and true to life. Colors are not the best part of a Jeffrey Jones painting, however. The best part is the amount of complicated emotion and character you can see in the people he paints. The way they stand, the way they look, the things they wear, all tell you what they are thinking—and what they are thinking never fails to be interesting. The *Blind Narcissus*, for example, consists entirely of a girl standing up to her ankles in a woodland pond, yet it conveys a complicated message of vulnerability, of introspective longing, of vanity, all at the same time.

Michael Kaluta, on the other hand, dazzles you with action and detail. He doesn't paint one person where three would do the job and he is unsparing in his props: swords, veils, urns, guns, flowers, jewelry, and all the paraphernalia necessary to create a complete setting. It is a characteristic of Kaluta's work that it is often difficult to tell what the people in his paintings are doing. You can be sure, however, that they are not contemplative types. Bright colors,

idealized human figures, and activity beyond the scope of his freeze-frame images are the hallmarks of his work. You get the feeling from a Kaluta painting that the activity started before you saw the picture and it will continue after you turn the page. Consider *Ayisha*, which is a portrait of sorts and therefore one of his more sedate works. It depicts a veiled lady with a beckoning look, but there are seven other characters in here, as well as a welter of tapestries, furniture, and oriental artifacts. When you look at it, you want to apologize for interrupting her in whatever she was doing.

Barry Windsor-Smith has stayed fairly close to the comic book style. He, like Kaluta, uses bright colors, but he doesn't seem to mix them as much. His colors appear a little flatter, a little closer to those which come out of the paint tube (and appear in the comic books). More than the other artists, he is fond of bloody swords and bulging muscles (although Kaluta runs a close second in this contest). He is steeped in mythological lore and his most pedestrian paintings have a heroic quality which seems to bring the viewer that much closer to the world of the gods and demigods. When he paints avowedly mythological subjects (*Pandora*, *Artemis and Apollo*, *Fate Sowing the Stars*), however, he is at his best. In these, he combines a Hellenic type of idealism with the colorful crowded

diverse nowadays: books, posters, record jackets, illustrations. "I haven't done matchbook covers yet," he quips.

## METROPOLIS

**T**HE ARTIST IS MUCH more disciplined than it would seem to the casual observer. For the past eight years, he has been working on an illustrated edition of the book *Metropolis* by Thea Von Harbou, the book from which Fritz Lang's famous film was taken. The project, after outliving half a dozen deals with different publishers and as many freelanced plans, seems to be reaching a whole new order of certainty with the English publisher, Dragon's Dream. "I have notes and lists of things to do," says Kaluta, "and going back eight years one of the recurring things is: 'Get to work on *Metropolis*.' There are a lot of sketches, a lot of layouts, and a lot of ideas."

His plans for this story call for forty paintings, but if you try to discourage him with the magnitude of it, he insists much of the work is already done. "All of these pictures have been building up in my mind," he says. "I read the book over and over again. I have read it so much that, when I was in Germany and a guy there had the first edition of it, I could follow it, even though I can't read German." It is part of Kaluta's approach

detail of the Italian Baroque. It works pretty well. If you have a mind for comparisons, however, you would have to say that while Jeffrey Jones tries to turn pictures into people, Barry Windsor-Smith tries to turn people into pictures.

Berni Wrightson is unabashedly manipulative. He wants to tickle your funny bone or chill your spine, or both. The people in his paintings are more like caricatures than real people, so you have the feeling that it's all in fun, but there's something about a fence festooned with human heads that goes beyond funny. His work isn't all morbid, however, and even some of the morbid stuff is comical. *Taking No Chances*, for instance, has four men trying to do in a vampire with a cross, a wooden stake, a garlic necklace, and an axe, under the protection of the rising sun. His attention to detail and authenticity in pursuit of humor is reminiscent of Monty Python films. His paintings have a lot of charm, especially if you like dinosaurs, axe murders, and coat-flapping storms.

I have tried to say nice things about *The Studio*. If you want to know why, it is because I didn't have to pretend to like the pictures in it; I did like them. Unlike what happens with a lot of art books for me, I was able to look at it and feel I was being entertained rather than ridiculed.

All right, Floyd. I did my best.

—Eugene Potter

## STATE.....ZIP.....

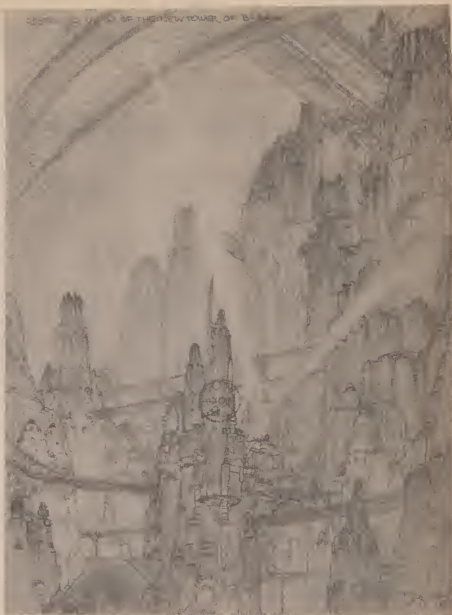
to his art that he can believe much of the work to be done before he has even prepared the canvas. To Kaluta, the story has a high priority and the biggest part of the job is in determining how he should tell it.

His affinity for *Metropolis* relates to his affection for the city of New York. "It's a very *Metropolis* city," he says. "In New York, there is an undercurrent: makemoneymakemoneymakemoney. I enjoy it, because it makes New York sparkle. You go to Chicago and there's no reason for anybody to be there because—oh, I'm sorry. I don't mean to insult anybody. They'll come to me and say, 'The next thing you're going to mention is gangsters.' But I've been in other big cities and they don't have that zzzt. Because no one is breathing down their neck to make money for no reason other than to pay New York. The city demands that you pay it as much money as you possibly can."

If it seems unusual that an artist committed more to his art than to his paycheck should find such an avaricious atmosphere invigorating, it is in keeping with the other aspects of Michael Kaluta. The image he allows himself to present to the world is one of paradox. He is the outstanding figure in the new narrative art, for example, yet he refuses to be typed. "In a movement," he says, "you have leaders and followers and I don't want to be a follower. On the other hand, I don't want anybody to tell me that I should do thus and so instead of what I'm doing."

#### STYLES AND TITLES

Kaluta's style is probably best represented by the first painting he did after breaking with the comic business. *The Sacrifice* is a complex narrative featuring the shapely, barely dressed woman and well-muscled barbarian so familiar to



Michael Kaluta

## Projections

by Robert Stewart

Galaxy looks at the making of Fritz Lang's classic film, *Metropolis*.

**O**CTOBER, 1924. Film director Fritz Lang (1890-1976) was sent to the United States by UFA (*Universum Film Aktiengesellschaft*) for a month-and-a-half long observation of Hollywood production techniques. "The first evening, when we arrived, we were still enemy aliens so we couldn't leave the ship; it was docked

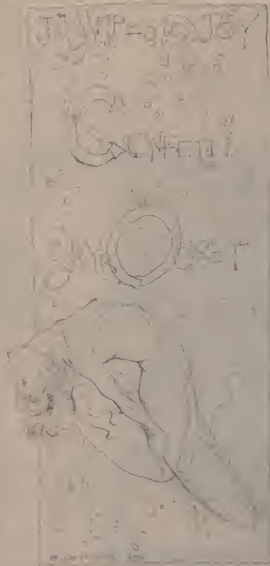
somewhere on the west side of New York." Lang told Peter Bogdanovich in 1965. "I looked into the streets—the glaring lights and the tall buildings—and there I conceived *Metropolis*."

The water lapped at Lang's ship. In the darkness, the metropolis glowed. Forced to spend the night in the harbor, Lang, a former architectural student (at Vienna's

Technical High School) and the son of leading Viennese architect Anton Lang, envisioned a Manhattan of the mind, an architectural dream of the year 2000, as he saw "across from the ship, streets lit as if in full daylight by neon lights and topping them oversized luminous advertisements—moving, turning, flashing on and off, spiraling—something that was completely new and different for a European in those days. This impression gave me the first thought for a town of the future."

He passed the idea on to his wife, Thea Von Harbou (1888-1954), with whom Lang had collaborated on all his films since *Das Wandende Bild* (1920), and she expanded it into the 1926 novel, *Metropolis*. Together they then fashioned their screenplay about the clash between the dictatorial ruling class of the towering urban complex, *Metropolis*, and the countless worker-drones who keep the





tographer for *I Love Lucy*, but during the twenties he ranked as one of the two or three most innovative and influential cameramen in the world.

For special effects it was decided to use the Schüfftan Process, invented only two years earlier by Eugen Schüfftan (later Eugene Shuftan, 1893-1977), enabling live action to be combined with photographic or model backgrounds. Between the camera and the rear projection screen there was a mirror with part of its reflective surface removed to expose clear glass. Positioned at an angle, the mirror reflected the image of live actors on a partially built set off to the side. This then blended with the rear projected blow-up of the model set.

Inspired by D.W. Griffith's *Intolerance* (1916), Lang choreographed his masses of actors in swelling and dissolving decorative patterns of movement. Sixteen-year-old Brigitte Helm (real name:

Gisele Eve Schittenheim) was cast in the lead roles of Maria/Robot Maria after Lang saw her in a student production. Cast as the magician-scientist Rotwang was Von Harbou's former husband, Rudolf Klein-Rogge.

Various sculptures were created by Walter Schultze-Middendorf, and forced perspective model sets, under the art direction of Otto Hunte, Erich Kettelhut, and Karl Vollbrecht, sprawled over an entire stage at UFA. For some scenes full-size constructions of ground-level sets were combined with the upper stories of the model sets. The city was a Bauhaus dream, often seen at angles recreating Lang's distant 1924 POV of Manhattan from across the harbor. A.E. Van Vogt later estimated the population of Metropolis "must have been in the neighborhood of thirty million." The shots of Metropolis alive with vehicular and air traffic involved innumerable

"I think one of the reasons that the 'New Romantic Art' came up is that the guys at The Studio were looking for a name to call what we do."

came up is that the guys at The Studio and a number of other people were looking for a name to call what we do, which is really just commercial art with soul. This art is a personal statement which happens to appeal to a large audience. In between fine personal art and commercial art, it is something nobody has been able to name yet. Barry Windsor-Smith, for example, refuses to be called an illustrator. I say I'm an illustrator. I like entertaining. I like pictures. I like making stories." Barry Windsor-Smith, incidentally, originated the name "New Romantic Art" in an interview in *Ariel* magazine.

The Studio to which Kaluta refers was a loft on West Twenty-Sixth Street, in which he shared working space with Jeffrey Jones, Barry Windsor-Smith, and Berni Wrightson. All four of the artists had successful careers in the comic business which they renounced in favor of the more or less unstated goal to launch a new era in professional art. The other three had to work hard to persuade Kaluta to join them (his first impulse is never one to join anything), but the four of them are good friends as well as colleagues. They finally persuaded him into the arrangement by pointing out that they had already painted the place. Such is the stuff of historical turning points.

Shortly, however, it became apparent that The Studio was something more than shared expenses. There was a bond of

hidden wires on the model set. Later, Hollywood made an effort to imitate and outdo this magnificent Metropolis model exterior with a \$250,000 futuristic model of 1980 New York City, built by mechanical effects director Ralph Hammeras for Fox's SF musical comedy *Just Imagine* (1930), a clip of which appeared as Killer Kane's city in *Buck Rogers* (1939).

By October, 1926, *Metropolis* was complete, running seventeen reels. It opened January 10, 1927, at Berlin's largest movie theater, the *Ufa-Palast am Zoo*. When it arrived in the U.S., the film was heavily edited (i.e., butchered) by Julian Johnson, playwright Channing Pollock (1880-1946), and Edward Adams. They reduced it to ten reels for American distribution by Paramount Famous Lasky Corp. *Metropolis* opened in the U.S. on August 13, 1927, and it is this version, running roughly ninety minutes, which

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followers of fantasy art. There is much more going on in the painting than the follower of fantasy art is used to, however. The woman is holding a knife, as if she intended to kill the chained barbarian. The barbarian is holding the woman, having just broken one of the chains. There are a couple of other people: one seems to be a gnome, one seems to be a magician or priest or something. There are heads, presumably from previous sacrifices, decorating the incredibly ornate dungeon in which all this is happening. There is an enormous snake in the edge of the picture, barely noticeable.

*The Sacrifice* is dark, yet it is a riot of color. It is dominated by a powerful action pose, yet extended study seems to reveal that the peripheral material is the most important part. The painting embodies much of the ambiguousness of which Kaluta is so fond.

Perhaps his most famous painting is the one called *The Fate of Dollies Lost in Dreams*, which realizes the terrors of childhood in the form of a bed flying through a darkened sky above a plummeting rag doll. There is a small face peering over the side of the bed after the falling doll. The painting is surrounded by an ornate border which is something of an artwork in itself. The viewer sympathizes with the frightened child, but a consideration of the title draws your attention to the doll and the realization that Kaluta has succeeded in painting terror on the face of an inanimate toy.

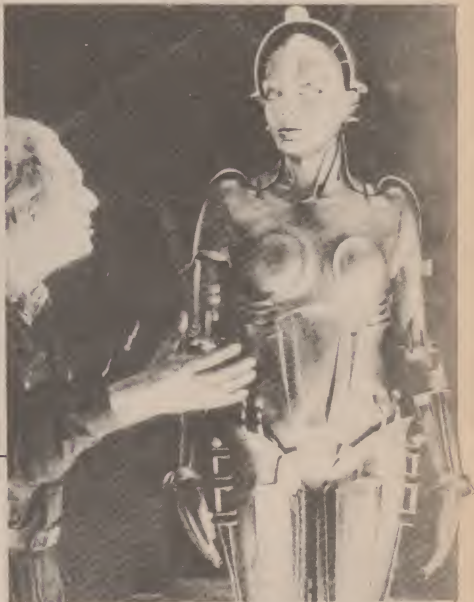
It is not unusual for the title of a Michael Kaluta painting to play an important part in the success of the work. According to Kaluta, titling the pictures is much of the fun in painting. "You can add so much just by bending things around," he says. "I was talking with Steve Hickman once and he had a painting of a woman in a curlycued

breastplate with a little animal on her shoulder and there was a huge fire-opal on the wall nearby. And I said, "Did you ever title that picture?" And he said, 'I call it *Princess of Atlantis*.' So I said, 'Wait a minute. Why don't you call it *Slave of Atlantis*?' He said, 'Look at the look on her face. It's so commanding.' I said, 'Yeah, there's power in having a slave with that attitude. Everybody expects a princess to be that way.' I don't know if he's going to go for it."

A word of caution, then, to those who think they understand the art of Michael Kaluta: Check the title. Chances are, it will change the picture entirely. Certainly it will enhance the value of the story in it.

#### THE STUDIO AND THE NEW ROMANTIC ART

In explanation of the origins of the new art, Kaluta says: "I think that one of the reasons that the 'New Romantic Art'



streets lit as if in full daylight by neon lights and topping them oversized luminous advertisements—moving, turning, flashing on and off, spiraling—

city functioning by laboring in ten-hour shifts.

In the spring of 1925, *UFA* began *Metropolis*, shooting nearly two million feet of negative at a cost of \$1,500,000, making it their most expensive film. Frederick Wynne-Jones, of *UFA*'s New York office, later released these statistics: 25,000 male extras, 11,000 female extras, 750 children, 25 Chinese, and 3500 pairs of shoes. Salaries during the production period of 310 days and sixty

nights totaled 1,600,000 marks, and 2,000,000 marks were budgeted for the costumes designed by Anne Willkomm.

*UFA* producer Erich Pommer (1889-1966), for *Metropolis*, replaced the Debie cameras with his first two Mitchell cameras, purchased in America, and these were put into use by chief cinematographer Karl Freund and his assistant, Günther Rittau (1897-1971). Freund and Lang experimented with new ways to use the camera for dramatic

emphasis. Lang later recalled, "Once, in *Metropolis*, I had to make an explosion. So I put the camera on a swing; the cameraman had it tied to his chest. And we swung it toward the actor who was experiencing this blast. He started to fall back the moment the camera swung toward him, and he pressed himself against the wall. Then the camera went back into first position, and you had the feeling of an explosion." In his later years Karl Freund was the cinema-



## It is a book of mooning women, oriental opulence, axe-wielding barbarians,

sorts among the four tenants (who kept different work schedules, incidentally), but it was not something which can be easily characterized. "We could see and feel it," says Kaluta, "but we couldn't describe it."

If the artists who worked in *The Studio* cannot describe the bond that existed among them, an outsider has no hope of doing so. The only way to approach an understanding of it lies in the book *The Studio*, which was published in late 1979 by Dragon's Dream (distributed in the U.S. by Big O). Comprising a representative sample of the art of Jones, Kaluta, Windsor-Smith, and Wrightson, it is a book of mooning women, oriental opu-

lence, axe-wielding barbarians, and scenes of graveyard horror. Most of it is wildly colorful, all of it is incredibly detailed, and sometimes it tends to the pukeish. All of it has a sort of "meta-illustration" quality, somehow conveying more story than the pictures which are usually created to go in books. There are definitely four different styles in the pages of *The Studio*, but there is a strong unity as well. Leafing through the book produces impressions of what *The Studio* must have been like.

It was attempts to describe *The Studio* which led to its break-up, however. The book encouraged Jones, Kaluta, Windsor-Smith, and Wrightson to analyze

continues to be seen in this country today. Not seen is an entire character (Freder's mother, Hel, who was loved by Rotwang before she turned to John Fredersen), the relay race in an Olympic stadium, footage of the robot Maria's erotic dance, and the imaginative title designs: an upward title crawl emphasizing the descent of the workers; a jagged "Moloch" of impressionistic letters flying into the frame in disorder and blood dripping from the word "Babel." *Monthly Film Bulletin* editor Richard Combs feels the many cuts "separated out various elements in the plot and stripped the characters' personal stories of their resonance." Currently, there is an on-going effort by the West German government to restore footage to *Metropolis*.

The plot inconsistencies and the simplistic, confused social content were condemned by many—including Lang

himself: "I didn't like it very much because it was a picture in which human beings were nothing but part of a machine. The main thesis was Mrs. Von Harbou's, but I am at least fifty percent responsible because I did it. I was not so politically minded in those days as I am now. You cannot make a social-conscious picture in which you say that the intermediary between the hand and the brain is the heart. I mean that's a fairy tale—definitely." Conan Doyle expressed enthusiasm, but H.G. Wells called *Metropolis* "quite the silliest film" (claiming that it borrowed from his *Story of Days to Come* and *The Sleeper Wakes*). But there was no denying the film's futuristic dream of visual splendor, described by Luis Buñuel as a "glorious symphony of movement, the rhythmic progression of wheels, of pistons, of hitherto unimagined mechanical shapes."

Hitler saw *Metropolis* in a small town

The Studio and its influences on their own work. The tenuous bond was not equal to that kind of analysis, according to Kaluta. "We all became introspective," he says, "we became real sensitive, and sparks were flying because of it. No one dared tell anyone what they thought, because they knew that they were thinking really heavy about themselves."

In a strange irony, the lease for *The Studio* was up when *The Studio* appeared on the stands, and the four artists moved to different locations. "Now it's a studio of the mind," says Kaluta. He adds: "What *The Studio* will become is whatever people thought it was, like a picture." The artist cherishes such "conceptual art." He feels much the same way about *The Studio* that he feels about his pictures: the viewer is welcome to make of it whatever he wants, or whatever he can. The artist's job is to tell the story, not to judge it.

*The Studio* might be remembered as the most comprehensive expression of the "New Romantic" art. Regardless of any single artist's willingness to use the phrase to describe his work it seems as good a term as any to denote a group of artists who are bent on self-consciously transcending commercialism. Some of them are willing to adopt it and Jeffrey Jones as well as some others have been known to put "NRB" on their paintings to signify "New Romantic Brotherhood."

Kaluta, like many of his pictures, is playful with the people who would label him. He laughs when "NRB" comes into the conversation and mentions "the nerbs" good-naturedly. When pressed, he will label himself, albeit playfully. "I'm a decadent," he says, "a New Romantic Decadent." Decadent or Romanticist, illustrator or storyteller, whatever you call him, Michael Kaluta is the fantasy artist to watch.

and also had a dream of the future: he told Goebbels that he wanted Lang to direct the official Nazi films. In *The Testament of Dr. Mabuse* (1932), Lang, a Jew, had Nazi slogans issuing from the mouth of an insane criminal. The film was confiscated. Then Lang was ordered to Goebbels' office at the new Ministry of Propaganda where Goebbels offered him the leadership of the Nazi film industry. Lang said "yes" to everything, returned home, packed, and—afraid that he was being followed—caught a train to Paris one minute before it left the station. Erich Pommer, the day Hitler took power, left UFA to join Lang in Paris. Brigitte Helm, after marrying a Jew, was accused of "race defilement," and she, too, fled to Paris. The dream was over.

The nightmare had begun.

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REVIEWS  
[Continued from page 61]

being a wromonger, since so many of his tales deal with men of war in a positive light. No one who reads this story with any understanding can agree with this conclusion. The theme here, as in so much of his writing, is the *responsible* exercise of power. Ian must actually prevent his fellow soldiers from leveling the city of Blauvain as a tombstone to his brother, their comrade (whom they loved far better than Ian). Ian and Kensie are two of Dickson's best loved characters, and this tale of their parting is sure to stick in your memory.

The trade paperback edition of this book is probably already sold out, because Ace made a ridiculously, foolishly small print run. The book was due out as a regular-sized paperback this spring. In the meantime, borrow a copy from a friend.



## A LETTER FROM THE CIRCULATION DIRECTOR

We have had a large number of inquiries from people wanting to know when their *Galaxy* subscriptions expire. We intend to answer them all, but until you get your answer, this explanation might be useful to you.

Just about everything with *Galaxy* has changed and until all our conversions are complete, until we get the magazine on to a regular publication schedule, we are going to have to scrap the *time* concept for subscriptions. We ask you to think of your subscription in terms of numbers of issues, rather than lengths of time.

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"Who knows what evil lurks in the hearts of men?"

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